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The Journal of the Department of Agriculture of Victoria, Australia.

M. h. w.

February, 1920.

A FARM HOME IN THE WIMMERA

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THE JOURNAL

OF

THE DEPARTMENT OF AGRICULTURE,

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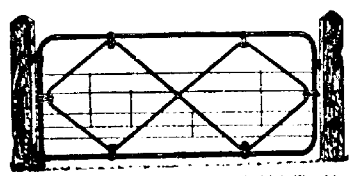

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THE JOURNAL

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OF

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Vol. XVIII. 16th February, 1920 Part 2.

THE BEET SUGAR INDUSTRY.

By W. L. Williams, Manager, Beet Sugar Factory, Maffra.

PART II. (continued from p. 15.)

Beet Seed.

Supplies of high grade beet seed have always been procured from Europe, but during the war seed was most difficult to secure, prices advanced fourfold, and the pre-war standard of quality was not retained.

Quality is all important to the factory, but the Maffra growers are not yet directly interested, because they are paid a flat rate for their beets regardless of quality. When the industry is more fully established there is little doubt beets will be purchased on a basis of sugar content.

Beet seed may be satisfactorily grown here, but the maintenance and improvement of its sugar-producing propensities is a most elaborate business, demanding exceptional care and heavy outlay that may only become justified as the beet sugar industry develops and creates a reasonable local demand for beet seed.

Science has perhaps affected the characteristics of the sugar beet more than those of any other known plant. Originally an annual, it has been influenced to develop sugar the first season, and defer seeding until the second, thereby improving its opportunities for the development of sugar, and lengthening the term for its extraction.

Little over a century ago the plant yielded about 5 tons per acre of beets containing 5 per cent. of sugar. By most rigid selection and careful breeding the sugar beet now yields from 10 to 20 tons per acre, and the beets test normally 15 per cent. to 16 per cent. of sugar, and sometimes reach as high as 25 per cent. of sugar. Such beets would naturally revert to a much lower standard very rapidly if not persistently and scientifically cared for.

524.

Without entering into the elaborate details of high grade beet seed production, the following will be sufficient to indicate that beet seed growing is an important industry which cannot safely be trifled with.

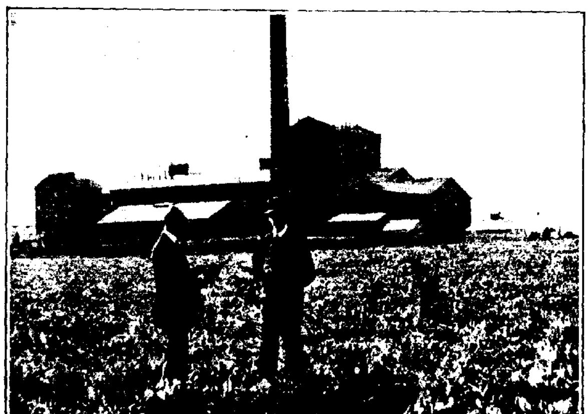
(1) Specially selected super-élite pedigreed seed is planted towards summer. In the autumn every beet therefrom is carefully tested physically and chemically, and those few passing the rigid tests are siloed or stored.

(2) In spring of the second season the stored mother beets are again submitted to physical and chemical tests, and planted to produce in the autumn a crop of super-élite and élite beet seed.

(3) In spring of the third season the élite seed is planted, and but lightly thinned to secure long, small, mother beets called "stecklings," which are lifted in autumn and siloed.

(4) In spring of the fourth season the "stecklings" are planted, and produce a crop of commercial seed in the autumn.

(5) In spring of the fifth season this commercial seed is planted, and produces beets in autumn for the manufacture of sugar.



Beet Plot at Maffra Factory.

Every year the super-élite seed must be carefully selected for the foundation of a new series. Germany and France in particular have specialized in the production of high grade beet seed, and owing to the difficulties occasioned by the war America has gone rapidly, largely, and no doubt successfully into the business.

In this district the factory has had to content itself with catch crops of beet seed. A reasonably high-testing plot of beets is reserved through the winter, and the roots are replanted the following spring as mother beets, yielding a crop of seed which is used commercially. This seed production has been very successful, the cleaning of the seed rather difficult, but the method of course is not safe. It has served a useful

purpose while European seed has been so hard to secure, and the seed is probably more virile than the imported, but to continue on these lines would adversely influence the sugar content.

If élite seed were procurable from year to year the factory could produce its supply of commercial seed which would have the advantage of being acclimatized, but it is unlikely that any reliable firm could be induced to part with its élite seed.

While the quality of the seed is so supremely important to success that no factory should even think of purchasing any but the very best, it is remarkable how climatic conditions may influence the sugar content of beets and sometimes bring unjust criticism on the quality of the

Weighbridge at the Maffra Factory.

seed used. As an example a set of results is submitted for comparison of Maffra results against Western District. The seed used in both districts was home grown, and produced at the Maffra factory from a French strain of seed. The season 1918-19 at Maffra was exceptionally dry right throughout the growing period and the beets were stunted. At the usual time of maturity heavy autumn rains set in, and the stunted beets took on a second growth with a lowering of sugar content and purity to such an extent that the average sugar content for the whole of the season's beets at Maffra was only 13.49 per cent. The Western District beets evidently enjoyed a fairly normal steady growth throughout the summer, being favoured with the usual coastal showers. The beets consequently received no serious setback, and came

steadily to maturity, resulting in a much higher sugar content than the Maffra beets produced from exactly the same line of seed.

Maffra Home-grown Seed.

Sugar Content Influenced by Climatic Conditions.

Plot No.	Location.	Topped Beet.	Sugar.	Purity.*	Sugar Content per Acre.	
	1918-19.	Tons per acre.	Per cent.	Per cent.	Tons.	
1	Maffra	15	14·0	80·6	2·10	Abnormal climatic conditions; unsteady growth
2	"	15	14·4	81·1	2·16	
1	Port Fairy	20	18·0	90·6	3·60	Fairly normal climatic conditions; steady growth
2	"	18	18·4	86·6	3·31	
3	"	19	17·2	91·4	3·27	
4	"	11	17·2	91·0	1·89	
5	Warrnambool.. ..	17	19·0	88·6	3·23	
6	"	24	20·4	89·8	4·89	
7	"	23	18·4	88·1	4·23	
8	"	18	19·0	86·5	3·42	
9	"	13	20·0	89·1	2·60	

* High purity favours a high extraction.

The production of single germ beet seeds is receiving a lot of attention in America, because such seeds would economize the cost of thinning considerably, and there seems every reason to believe that such a characteristic may be developed and fixed in course of time.

Imported sugar beet seed a few years back could be distributed at 6d. per pound; recently it has cost in some cases as high as 2s. 6d. per lb., and is now being distributed to growers at 1s. 6d. per lb.

New Beet Sugar Factories.

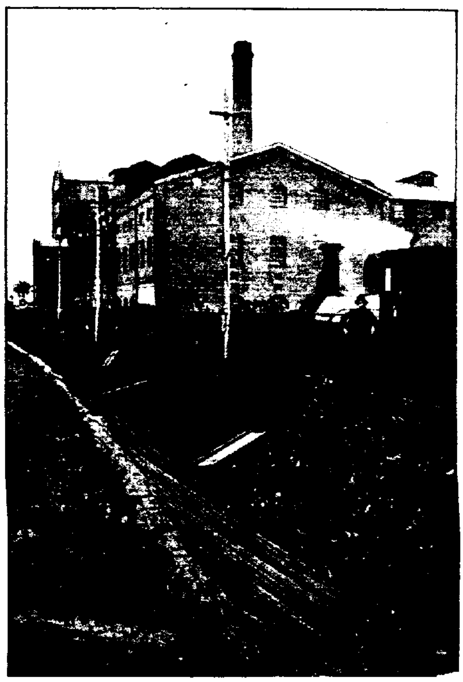
The location and construction of a new beet sugar mill calls for a lot of forethought and consideration, yet one is safe in saying that there is only one thing that need very seriously exercise the minds of those interested—"an assurance of a satisfactory supply of beets from year to year." This is most essential, and if assured an up-to-date *efficient mill has no excuse for anything but success.*

The supply of raw material is so important that no district should consider the beet sugar industry without reasonable proof that the soil and growers are capable and willing to produce plenty of beets. When the farmers have promised suitable support in the way of raw material, which is more important than cash, then the promoters should secure independent rights over a few thousand acres of land to balance results against the natural inclination of many farmers to follow occasional high but varying priced crops. Frequently they follow such fancy crops one year too late. Furthermore, industrious beet labourers and newcomers sometimes desire, to launch out as beet growers, and the factory can then accommodate them with land at reasonable rates; whereas uninterested land-owners are often disposed to force rents up unreasonably. The factory needs to regulate its supply, and to encourage growers to grow beets as profitably as possible, and a substantial area of land in the hands of the promoters to be sub-leased on easy conditions and cropped on a rotation basis is a great advantage and necessary to balance the production from year to year.

CAPACITY OF FACTORY

(advisable for present Victorian conditions).

A factory capable of treating 500 tons of beets per day is desirable. America tried European methods and small capacity mills, and practically all of these failed financially, because America had to face high costs for labour and material. Very much improved labour saving and larger capacity plants were then tried, and T. G. Palmer, a noted sugar authority says:—"To-day a 500-ton factory is regarded as the minimum sized factory for profitable operation in America." These efficient plants have invariably made good wherever the supply of beets has been satisfactory. A majority of American mills treat 1,000 tons per day. At the same time it is not advisable to have the capacity of a mill ahead of the quantity of beets readily available within easy distance.

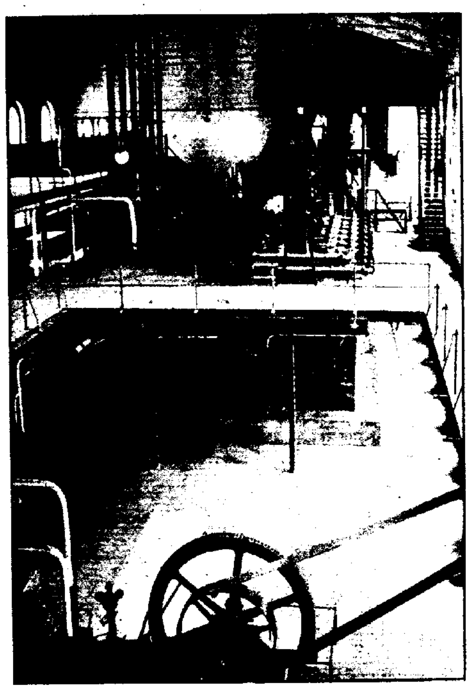


Special Beet Train at the Maffra Factory Bins.

To satisfy a 500-ton mill 4,000 acres of beet is desirable, but the first season both growers and factory would be better served to start off with a smaller acreage well cared for, as it is a crop that demands good and very prompt attention at certain stages. Inexperienced growers and labourers would be more worried over half the area the first season than the full area after experience.

COST AND FACTORY REQUIREMENTS.

Under present conditions it is impossible to make anything but a vague estimate of the cost of a 500-ton mill. Probably £150,000 plus working capital, plus sundry beet loading and railway facilities might be required, and undoubtedly a large part of the plant could be made in Australia to advantage. This would be a heavy outlay, due to the prevailing high costs, but running at capacity such a mill would directly employ 600 men in field and factory, and be of interest to a



View of Beet End at the Maffra Factory.

very large number indirectly. Also at capacity it should annually produce sugar, &c., to a value approaching the factory cost of £150,000.

40,000 tons of beets would cost	£60,000	
Manufacturing costs, repairs, &c. (estimate) ..	45,000	
Other costs, including management, interest and depreciation (estimate)	20,000	
Operating costs		125,000
Value of products, sugar, &c. (say)		145,000
Balance		£20,000

The running costs and value of products are liable to much variation, and should only be taken as a very general indication of results. For safety the above valuation of products has been taken at a low figure.

A supply of 3,000,000 gallons per day of good water would be required during the operating period.

Five thousand to 6,000 tons of coal would be needed per annum.

Fifteen hundred to 2,000 tons of high-grade lime rock.

Large quantities of sugar bags, cotton filtering material, coke, manufacturing supplies and beet seed would also be necessary.

A factory site should be central to the beet areas, convenient to railway service, well drained, and such that surrounding areas could be irrigated with the waste waters if necessary.

The value of the industry to its district and the State is best measured by the amount of employment and the wealth it may produce and distribute per acre of land involved.

General Information.

America has nearly 100 beet sugar factories producing about 800,000 tons of sugar, while cane interests represent about 250,000 tons, but America's home requirements are over 4,000,000 tons per annum, made good by large supplies from adjacent cane sugar producers, mainly from Cuba. America is now learning to appreciate the many economic advantages of producing as much home-grown sugar as possible, and, realizing the improvement in agricultural methods due to sugar beet growing, the Government is doing its best to encourage expansion.

The demand in America as in Australia and elsewhere seems likely to keep well ahead of available supplies, and the *per capita* consumption is certain to increase with the improved living conditions and the realization that sugar is one of the very chetpest forms of energy-producing food. The heat units of sugar amount to 1,814 per lb., which is very much ahead of most other foods, and distinguishes it as a particularly valuable energizing substance. At 3½d. per lb. this "concentrated sunshine" is probably the cheapest and pleasantest means of developing and maintaining human energy.

The *per capita* consumption of sugar prior to the war in some of the principal countries was approximately as follows:—

Country.	1913–14.
	lbs.
United States	89
England	93
Germany	45
Austria-Hungary	29
France	44
Russia	25
Italy	12
Australia (1918–19)	120

The world's production of sugar has shown a steady increase, but recently the demand has outstripped the supply which has been steadied

by the war. With a strong demand and many European beet sugar factories destroyed the production is not likely to fully satisfy the growing demand for some years to come.

World's Sugar Production.

Year.	Cane.	Beet.	Total.
	Tons.	Tons.	Tons.
1850	1,200,000	200,000	1,400,000
1860	1,341,000	450,000	1,791,000
1870	1,741,000	846,000	2,587,000
1880	2,027,000	1,820,000	3,847,000
1890	2,443,000	3,669,000	6,112,000
1900	5,959,000	5,944,000	11,903,000
1910	8,566,814	8,503,970	17,070,784
1914-15	10,165,700	8,216,800	18,382,500
1915-16	10,675,700	5,032,000	15,707,700
1916-17	11,383,800	5,673,200	17,057,000
1917-18	12,505,800	5,050,600	17,556,400

The world's requirements are now computed to be 21,000,000 tons, plus a substantial annual increase for the future.

The production and consumption of sugar in Australia since 1911 has been approximately as follows:—

Australian Sugar Production.

Period.	Production.	Consumption.
	Tons.	Tons.
1911-12	190,595	233,000
1912-13	129,877	241,000
1913-14	265,029	255,000
1914-15	245,876	264,000
1915-16	159,640	262,000
1916-17	193,037	266,000
1917-18	327,589	274,000
1918-19 (estimated)	199,000	279,000
1919-20 (estimated)	155,000	285,000

With a growing population and demand there is scope for increased production.

Apart from its direct worth in sugar the beet sugar industry has been responsible for a notable and favorable influence on the agriculture of every country where it has been established. Both France and Germany largely put the beet crop in place of a bare fallow in their rotation system, and secured, in addition to the sugar, improvements up to 100 per cent. on the yield of grain crops so influenced. Australia's wealth and strength undoubtedly depend on the rapid and intense development of her rural interests, and the sugar industry, cane or beet, is capable of playing a most valuable part in such development, because it demands intense culture, and produces so much wealth per

acre. Australia's sugar bill will soon exceed £10,000,000 per annum, an amount much better spent in Australia than abroad.

SOME DIFFICULTIES.

Against the beet sugar industry and many other industries the Australian frequently shows an inexcusable amount of prejudice and lack of patriotism, due undoubtedly to a form of national modesty which causes him to denounce local products and praise imported. A little pride and confidence in our own products may be a wonderful stimulus to help increase production and improve the quality of our goods.

Constantly one finds people declaring that beet sugar is useless for jams and preserves, and it is quite refreshing to read a recent report on "Why English confectioners prefer beet sugar to cane for high grade confectionery!" The reasons are substantial and interesting, but too lengthy to review here. In general, Europe has always held a splendid reputation for the quality of her confections, preserves, jams, and condensed milk manufactured almost entirely with beet sugar. Chemically refined beet and cane sugar cannot be distinguished one from the other. They both adhere to the one chemical formula $C_{12}H_{22}O_{11}$. It may be sometimes possible, but by no means certain, for manufacturers to distinguish by the grain. Housewives need have no anxiety in using beet sugar. Europe has given it 100 years successful experience. America has made elaborate and definite tests with both sugars, and could find no difference in the results of the preserves and jams so tested. If the home-made jams and jellies fail it is due either to faulty methods of manufacture or more likely to the fruit. Wet season fruits are far less favorable in quality than those matured under sunny conditions, and variations in quality can only be partially corrected by special care in boiling. If the fruit or boiling is faulty it does not seem right, though it may be convenient, to blame the sugar, which in itself is quite pure.

Even the land-owner frequently takes a delight in declaring that sugar beet growing ruins the soil. In correct farming it can and does actually "improve" the soil. It certainly absorbs a lot of moisture, but that does not impoverish the soil because it is constantly being replaced. From a sugar production point of view the beet is simply a plant developed in the soil to manufacture sugar from constituents not of the soil. $C_{12}H_{22}O_{11}$ signifies a combination of water and carbon. The beet leaves play a most important part in the production of sugar. They are studded with "stomata" or breathing pores which breathe in carbon dioxide from the atmosphere, assimilate the carbon and set free oxygen. Under the influence of the green colouring matter of the leaves of chlorophyl and sunlight, the carbon dioxide combines with water in such a way as to form probably glucose first, then starch, gradually liberating the oxygen. Starch is insoluble, and is transformed into sucrose and glucose, and conveyed in solution to all parts of the beet plant to aid its development and towards maturity to store a liberal supply for the subsequent reproduction of the plant by developing seed. By harvesting the beets at maturity this seeding function is intercepted, and the stored sucrose is manufactured into commercial

sugar for human consumption. Thus is energy actually won from the atmosphere and stored in the beet as sugar or "concentrated sunshine," becoming available under manufacture as a most valuable energy producing food. From this it may be understood that the actual sugar in the beets does not in any way rob the soil of plant food. The plant itself absorbs a quantity of plant food, but with correct farming a great part of this may be restored to the soil in excellent form for subsequent crops. The tops and crowns which contain the bulk of the plant food may be ploughed in or fed off and the manure ploughed in. The pulp containing the balance of the plant food may also be fed to stock and returned in the form of manure. However, the great reasons for the improvement of the soil by beet growing are—

1. The persistently intense deep culture demanded by the beet crop invariably improves the texture and productivity of the soil.
2. The deep rooting disposition of the sugar beet causes it to throw down a deep tap root, under examination found to be massed with fibrous roots. These roots and countless rootlets reach to depths quite unusual with most crops, and greatly enrich the soil by bringing up fresh supplies of plant food from the subsoil to the surface soil. At the same time they open up and aerate the subsoil, and add a mass of humus in the form of root matter which gives life and vitality to the soil, and is so essential to fertility.

Both consumers and producers of beet sugar might reflect on these matters, because practice as well as knowledge indicate that the industry is worth commendation rather than prejudice.

Regarding the Maffra beet sugar industry it must be borne in mind that the mill was constructed over twenty years ago when manufacturing labour and materials were cheap. With this same plant, after lying idle for ten years and with no important improvements, the Department of Agriculture has made a clear demonstration that beet growing and sugar manufacturing may under Victorian conditions be quite congenial, profitable, and of great advantage to its district.

It has shown that a substantial rainfall or irrigation is necessary.

It has also shown that with success comes the tendency for landowners to make it difficult for growers to secure sufficient land at reasonable rates. Although the factory's substantially capitalized plant, forced to operate on a small acreage with increasing costs of labour and material, has shown a degree of success and a satisfactory demonstration, it is not to be expected that the industry can expand and take its rightful place as a vigorous industrial proposition without sufficient land to produce a satisfactory supply of raw material. Granted such, the Mill, in order to cope with the supply and contend with high costs would, as a matter of course, be remodelled and brought up to efficiency on a 500-ton per day basis to the advantage of producer, worker, and consumer.

As a business proposition the Maffra factory or any other Mill that may develop needs control of a substantial acreage of good land, suitable climatic conditions, and an efficient plant.

CROP AND FALLOW COMPETITION, DIMBOOLA, 1919.

Report by the Judge, H. A. Mullett, B. Ag. Sc., Chief Field Officer, Department of Agriculture.

I have much pleasure in forwarding my report as judge of the local Crop and Fallow Competition recently conducted under the auspices of your Society. In so doing, may I be permitted to commend the Society for its progressive action in resuming this class of competition after a lapse of some years. There is, I believe, no more effective way in which the Society can assist agricultural advancement in the district, unless it be the widening of the scope of the present competition to cover the entire farm, as was once the practice.

Each year Dimboola farmers are slowly but surely adding to their knowledge of the methods which give the heaviest yields of wheat. Some farmers, however, consistently grow better crops than their neighbours, and on land of so uniform a character as the black, fertile Wimmera plains, that there can be usually only one reason for the difference—it lies in the farming methods. How often does it happen that a wire fence is all that separates land growing 10-bag crops from that growing 7?

On the face of it, there would seem to be no reason why this state of affairs should continue, but the difficulty is that the good men do not advertise their methods, and their less successful neighbours are not easily convinced. Indeed, the latter are quite justified in treating isolated instances of the apparent success of new-fangled notions with some caution. It would be a different matter if systematic information were collected each year on the methods by which the best crops in the district were grown. Then any well-corroborated instances could be presented with added weight.

At present it is nobody's business to collect and prepare such information and pass it on for the public good. In America, and some of the advanced agricultural countries of the world, work of this kind is done under the County Agent system; but, in the absence of that, may I suggest to your Society that the Crop and Fallow Competitions might be utilized for the purpose. The experience at Nhill over the past 20 years certainly shows the plan to be feasible and the results valuable.

The collection of the information necessarily involves the inspection of a number of the crops, a decision as to which are best, the collection of details of the methods of growing crops, the elimination of disturbing factors affecting fair comparisons, such as soil, the uneven distribution of the rainfall, and past history of the field, &c.; all of which fall naturally within the scope of the duties of a judge of a competition of this character.

Such information has been systematically collected at Nhill, and issued annually in printed form by the Society, and having special local interest, it has been a potent agent for the rapid spread of sound agricultural practices in that district.

The Season.

The season has been the driest recorded since the 1914 drought, only 13¾ inches of rain having been registered at Dimboola. It was,

however, sufficient to grow good crops of wheat where attention was paid to the careful working of the fallows and the seeding made reasonably early. As elsewhere in the Wimmera, a considerable proportion of the rain fell in February and March (4.48 inches), outside the growing period of the crop. Where this rain was carefully conserved, it had a vital bearing on the yield of the crop.

Numbers of farmers were deterred from entering the competition on account of the dry season—a regrettable fact, because the peculiar conditions this year offered a unique opportunity for the gleaning of valuable information on the methods that were most satisfactory under dry conditions.

The presence of such a small field of competitors practically precludes sound deductions being made from a comparison of the individual methods.

Mr. E. Schaefer's Mallee Crop of Red Russian.

Results.

Section I.—For Best Growing Crop of 150 Acres of Wheat Grown on Mallee Land by a Farmer Owning 640 Acres of Land or over.

Name.	Variety.	Yield.	Purity and Trueness to Type.	Disease.	Weeds.	Evenness.	Total.
Possible Points ..	.. .. ..	35	20	15	15	15	100
E. Schaefer	Red Russian ..	15	18	10	12	14	69

There was only one competitor in this section.

The fallow upon which the bulk of this crop was grown received the following treatment:—In 1917, the paddock was in oats. In the following July, it was ploughed with a mouldboard plough to a depth of 3½ inches; it was then harrowed. In September, the paddock was scarified, then harrowed, and again scarified before harvest. After harvest the land was harrowed, scarified after the March rain, and re-scarified in May in front of the drill, and sown in mid-May with 60 lbs. seed and 60 lbs. manure. The variety, Red Russian, was relatively true to type. In a second paddock of the same variety, which

had two less workings and was not sown until 15th June, the yield was not within a couple of bags to the acre of the first-mentioned. A little ball smut was present.

SECTION III.—FOR BEST GROWING CROP OF WHEAT OF 100 ACRES GROWN ON MALLEE LAND BY A FARMER OWNING NOT MORE THAN 640 ACRES OF LAND.

Name.	Variety.	Yield.	Purity and Trueness to Type.	Disease.	Weeds.	Evenness.	Total.
Possible Points	.. .. ..	**35**	**20**	**15**	**15**	**15**	**100**
J. Glatz	Federation .. Red Russian .. Penny ..	19	16	13	12	14	74

Mr. J. Glatz's Mallee Crop of Red Russian.

There was only one competitor in this section. The crop was, nevertheless, of a high standard of excellence, and there was no smut.

The fallow on which the crop was grown was ploughed early in June to 3½ inches. Before harvest it was scarified and harrowed twice. After harvest it was scarified in March after the rain, and then scarified, harrowed, and drilled in early May. This crop was sown with 1½ bushels of wheat and 112 lbs. of superphosphate, and its appearance is just one more instance of many this year which should banish for ever the theory that in a dry year heavy dressings of "super." burn off the crop. Mr. Glatz's experience in this respect is similar to that of a large number of Wimmera farmers, and is in thorough accord with the results obtained at the Government experimental plots at Longerenong.

The heavy seeding is also of interest, because of the strong tendency there is among Wimmera farmers to increase the amount of seed sown per acre. This year could well be looked upon as a critical test for such a practice. It is interesting to recall that Mr. R. Blackwood's second-prize crop at Nhill was sown with 1¼ bushels of seed and 112 lbs. of superphosphate; and the third-prize crop with 80 lbs. of seed and 90 lbs. of superphosphate. Several of the heaviest crops in the Minyip and Rupanyup districts were also sown with 75 to 80 lbs. of seed and 90 to 100 lbs. of superphosphate.

It should be borne in mind, however, that these results were achieved in every case on well-worked fallow, where there were naturally increased supplies of moisture and plant food available for plants to utilize.

There is no justification for the increase of seed on badly-farmed land, where, on the contrary, it might prove detrimental.

Section V.—For Best Growing Crop of Wheat of 150 Acres, Grown on Land other than Mallee, by a Farmer Owning 640 Acres of Land or over.

Name.	Variety.	Yield.	Purity and Trueness to Type.	Disease.	Weeds.	Evenness.	Total.
Possible Points ..	.. .. ..	**35**	**20**	**15**	**15**	**15**	**100**
T. E. Moller	Federation ..	13	17	6	9	12	57

There was only one competitor in this section.

The paddock upon which the crop was sown was, in 1917, under wheat, which yielded 11 bags to the acre. The stubbles were burnt. Between July and August it was ploughed, harrowed twice with the scarifier-harrows, then scarified and lightly harrowed. After harvest it was scarified in February, and then in front of the drill. The sowing took place in the first week in June, and the paddock was harrowed after the drill. Sixty pounds of seed were used, and 75 lbs. of superphosphate. The variety was Federation. Mustard and wild oats were present, and the crop was smutted.

Section VII.—For Best 100 Acres of Growing Crop, Grown on Land other than Mallee, by a Farmer Owning not over 640 Acres of Land.

Name.	Variety.	Yield.	Purity and Trueness to Type.	Disease.	Weeds.	Evenness.	Total.
Possible Points ..	.. .. ..	**35**	**20**	**15**	**15**	**15**	**100**
P. H. Müller ..	Federation .. Penny ..	23	17	14	13	14	81
A. A. Moller.. ..	Federation	19	16	..	11	14	60
H. Budde	Federation ..	11	15	7	9	10	52

Mr. P. H. Müller's winning crop was a very creditable one for the season. There were two varieties—Penny and Federation. The Penny was the better of the two; it was true to type, and very well headed. Both crops were even and level. The only disease was a little Flag Smut or Black Rust.

The following treatment had been given:—In 1917, the paddock was in oats, which was cut for hay. It was fallowed to 4 inches with the mouldboard plough in August, then harrowed twice. It was scarified at the beginning of October, and harrowed three weeks later. The paddock was harrowed, and spring-toothed in February after rain; subsequently, it was scarified, drilled, and harrowed at the end of May and beginning of June with 65 lbs. of seed and 90 lbs. manure.

The fallow on which Mr. A. A. Moller's crop of Federation was grown was ploughed somewhat later. It received seven workings in

all. It was sown at the same time as Mr. Müller's with 75 lbs. of seed and 80 lbs. manure. The crop had been fed off. It was smutted.

Mr. Budde's crop of Federation was sown about the same time on July fallow which had in all six workings, including the ploughing. The crop was thin. It had been inadvertently pickled too heavily, which killed a large percentage of the grain; but, even so, smut was present, precaution not having been taken to dip the seed and remove all floating scum and smut balls by skimming.

Summarizing the Results.

Crops.—The inspection of the crops submitted for competition has impressed me strongly that there is need for paying stricter attention to the care and attention of the seed wheat used at Dimboola. I do not think it reflects credit on an up-to-date farming community that there should be only two crops in the competitions quite free from smut. There is no doubt that there is something radically wrong with the method of pickling generally adopted locally. It appears to be one in which a certain allowance of bluestone is made for each bag of wheat pickled, without due regard for the amount of water used, or the length of time the pickle is in contact with the wheat. A fertile source of infection is the failure to take systematic precautions to remove unnoticed smut balls that may happen to be present in the seed. Seed known to be smutted should, of course, not be sown.

There is only one method that has proved uniformly successful in the prevention of smut. The pickle must be weighed, the water measured, the time of contact must be definite, and provision be made to remove any stray smut balls in the seed. The standard strength of pickle is 1½ lbs. of bluestone dissolved in 10 gallons of water, or 1 lb. of formalin dissolved in 45 gallons of water. The seed should be poured into the pickle, and any scum or smut balls which float after stirring removed. The immersion should be for not less than three minutes, and not longer than four minutes. There are several types of pickling machines which are specially designed for this work, but there are other sorts which are not so effective. In the absence of a good pickling machine, each bag should be broken into two or three butts, and these should be dipped while open, and after vigorous rinsing, skimmed of rubbish while still submerged in the pickle.

There is also the need for the wider introduction into the district of improved strains of existing varieties of wheat. At the State Experiment Farms, this work is carefully carried out, and considerable improvement in the yielding powers has resulted. Attention has been especially concentrated on Federation, with the result that this variety so improved has been proved at Longerenong College to yield, over the last six years, an average of 6 bushels to the acre more than the strain from which it was derived. Federation is rightly the favorite variety grown at Dimboola, but there are other varieties, such as Penny, Yandilla King, &c., which have their place on every farm. The place for these slow-maturing varieties is at the beginning of the seeding season.

On well-worked fallow, the use of 1 cwt. of superphosphate to the acre could be made routine practice. Not only will the additional manure pay for itself and yield an average extra profit of 3s. 6d. to 4s.

per acre, as it has been shown to do year in and year out at Longerenong, but the feed on the stubble paddock is proportionately increased—an important consideration at the present time.

It is only by careful attention to each one of these departments of wheat-raising that the maximum profits are made.

In addition to special attention to the seed and the application of heavy dressings of superphosphate, another important factor in raising the maximum crop year after year and still maintaining fertility of the land is the growth of oat crops systematically over the farm in rotation with wheat, as often as can be arranged.

The Up-to-Date Residence of Mr. T. E. Moller, Dimboola.

FALLOWS

The most important consideration of all has been left to the last—that is careful cultivation of the fallows, and it must be admitted that the majority of Dimboola farmers rightly pay particular attention to working their fallow land. It is somewhat doubtful, however, if the full significance of the working is always appreciated. The primary object of fallowing in the Wimmera is to store moisture in the ground and make it available for the crop next year, thus supplementing the rain which falls during the growing period of the crop. The average rainfall in the Wimmera is only sufficient by itself to produce a five-bag crop. In this case, about 4 inches are actually utilized by the crop, the rest passing away as evaporation from the surface, or by percolation into the depths of the soil. It has been proved at Longerenong that, by carefully working the black soil after each rain, an extra 4 inches can be conserved in the subsoil; *i.e.*, on the normal rainfall, a 30-bushel crop is possible.

The effect of working after rain is to lessen the evaporation from the surface of the soil by the creation of a blanket of loose dust. The average farmer cultivates his paddock mainly to kill weeds. At the same time, he conserves moisture; weeds, therefore, are, strangely enough, something of a blessing in disguise.

It is well established that early fallow is the best fallow. After the ploughing, the main object of the farmer—apart from killing rubbish—should be to create a fine mellow mulch or layer of loose soil from 2½ to 3 inches deep, over a firm, moist, well-consolidated soil underneath. The implements should never be allowed to sink to the original depth of the ploughing, because there is a tendency of the black soils in that case to dry out and refuse to adhere, thus producing a loose seed bed, so detrimental to wheat. The working of the fallows during summer after rain with a light implement, such as harrows or spring-tooth cultivator, is especially important. Every working is worth at least a bushel or two of wheat.

Last year, the heavy summer rain was literally worth bags of wheat to those who carefully conserved it.

The secret of the successful cultivation of black land in the Wimmera is to do the necessary operations at the right time. If worked on the dry side, the fallow can never be induced to assume that fine mellow appearance which, to the experienced eye, betokens a capacity for high yields of wheat. In an adequately-mulched fallow of this description, it is always possible to obtain the soil at a foot below the surface in a sufficiently moist condition to mould with the hand.

Results—Fallows.

Section II.—For Best 150 Acres of Fallow on Mallee Land Exhibited by a Farmer owning 640 Acres of Land or over.

Name.	Character of Soil.	Moisture.	Mulch.	Weeds.	Cultivation.	Total.
Possible Points ..	.. .. ..	**25**	**25**	**25**	**25**	**100**
E. Schaefer	Red clay loam	18	18	24	20	80

There was only one entry in this section.

The fallow was rather on the rough side and unevenly cultivated. It was ploughed in July to 4 inches. The land was on the dry side when broken up, so that it had to be ploughed somewhat deeper than is usual for this class of land. In the spring, it was scarified and subsequently harrowed, then scarified again.

Section IV.—For Best 100 Acres of Fallow on Mallee Land Exhibited by a Farmer owning not over 640 Acres of Land.

Name.	Soil.	Moisture.	Mulch.	Weeds.	Cultivation.	Total.
Possible Points ..	.. .. ..	**25**	**25**	**25**	**25**	**100**
J. Glatz	Red clay loam ..	20	20	25	24	89

There was only one entry in this section.

Mr. Glatz showed 130 acres of fallow, which was fairly high in moisture underneath, though it was drying out because the surface mulch or blanket of loose soil was on the thin side. The cultivation was otherwise exceedingly well done. The paddock received the following treatment:—It was ploughed in June to between 3 and 4 inches, and harrowed immediately afterwards. In August it was scarified and harrowed again; subsequently it was scarified and harrowed twice, once in the beginning of October and again towards the end of that month.

There was an absence of weeds. Last year the paddock grew a crop of wheat. On the whole it was an excellent piece of fallow.

Section VI.—For Best 150 Acres of Fallow Land, other than Mallee, Exhibited by a Farmer owning 640 Acres of Land and over.

Name.	Soil Type.	Moisture.	Mulch.	Weeds.	Cultivation.	Total.
Possible Points ..	.. ..	25	25	25	25	100
T. E. Moller ..	Black, red patches ..	20	20	24	23	87

There was only one entry in this section.

This fallow was in very fine condition, though somewhat rough on a red bank. The moisture was very fair, though rather deficient owing to the ploughing having been left till August and September. The mulch was deep and mellow, and there was fair consolidation underneath.

Portion was ploughed in August, then scarifier-harrowed twice. Subsequently it was scarified, and then given a light stroke with ordinary harrows.

The remainder was not ploughed until September, and then received similar treatment.

Section VIII.—For Best 100 Acres of Fallow, on Land other than Mallee, Exhibited by a Farmer owning not more than 640 Acres of Land.

Name.	Soil.	Moisture.	Mulch.	Weeds.	Cultivation.	Total.
Possible Points ..	.. ..	25	25	25	25	100
P. H. Müller	Black, red patches ..	21	24	25	24	94
H. Budde	,, ,, ,, ..	22	23	20	20	85
A. A. Müller	,, ,, ,, ..	19	21	20	19	79
W. Elsom	,, ,, ,, ..	22	23	17	15	77

Mr. Müller's fallow was in excellent condition. The moisture had been conserved by the provision of 2½ inches of fine mellow mulch overlying a moist, firmly consolidated seed bed. There was a complete absence of weeds, and the cultivation implements had worked evenly and straight.

The paddock was ploughed in July to 3½ inches; it was then harrowed twice in August. It was scarified in the beginning of October, and harrowed at the end of October.

Mr. Budde's fallow showed a higher moisture content; the mulch was deep and mellow. The cultivation had not been so effectively done, especially on the red ground, and the oats were showing green. The paddock received four workings, including the initial ploughing in July.

. . . .

In conclusion, I have to thank the Secretary, Mr. Bennett, and Mr. Schultz (who provided the car), for their courteous assistance during the work of judging.

A royal decree has recently been made by the Italian Government to provide for the necessity of increased agricultural production, with special reference to cereals, vegetables, and edible tubers. It had been felt in many quarters in the country that proper use was not being made of large tracts of land which had never been placed under cultivation, owing to the difficulties raised by the land-owners in granting leases on adequate terms and to the indisposition of land-owners or the State to sink any capital for the development of such land. Expression to the prevalent feeling of dissatisfaction was shown on the 24th August by the organized seizure by a number of farmers of tracts of uncultivated land in 200 localities in the vicinity of Rome, chiefly at the instigation of the "League of Fighting Soldiers."

It was to deal with the situation thus created that the Royal Decree was issued. Under the decree farmers belonging to legally constituted agrarian associations are secured in temporary occupation of land concerning which questions of civil custom have arisen, for a period of four years. The land-owner is to receive fair compensation, and when this cannot be decided by common agreement the matter will be determined by an arbitration committee. There is a right of appeal against a decision by this committee. Under certain provisos, framed in the best interests of land cultivation, application may be made before the termination of the provisional occupation for the occupation to be made permanent.

The decree also provides for the granting of State assistance where it is considered desirable, empowers agrarian societies to collect from their members payment due in respect of incoming subscriptions, repayments, &c., on the principle of the collection of direct taxes, and makes the Minister of Agriculture responsible for the supervision of agrarian associations and bodies.

—*Journal Board of Agriculture*, England.

PEAR GROWING IN VICTORIA.

(Continued from page 669.)

By E. Wallis, Orchard Supervisor.

Fencing the Orchard.

Before the young trees are planted they should be treated so as to give them protection later from hares, rabbits, and other vermin. In order to minimize the expense of establishing the orchard, some growers endeavour to protect the trees by limewashing, coating them with liquid manure, or by tying bark or rushes round them. At the best, these means afford only partial and temporary results in the way of protection. It is better for the prospective grower to incur the extra expense of providing a vermin-proof fence at the outset, which is the most reliable and permanent means of protection it is possible to provide.

If trees be placed in their allotted positions in the orchard without such an adequate safeguard irreparable damage to them is often caused, and thus all the previous preparatory work is rendered useless.

The succulent cambium of the pear wood is singularly attractive to both hares and rabbits, and in order to obtain it they will gnaw away the outer bark, and probably kill the trees they attack.

A fence constructed of posts, wire, and wire-netting will prove the most satisfactory safeguard against vermin, and may be made of posts split from durable bush timber, and placed in the ground 7 or 8 feet apart. Five wires should be used, three of No. 8 fencing wire and two of barbed wire, the latter being placed about 6 inches apart at the uppermost part of the fence. Commencing about 6 inches below the bottom barbed wire, the three plain wires should be equi-spaced, and will act as a support to the wire-netting, which should be 3 ft. 6 in. wide, with an inch and a half mesh. The netting should be sunk 6 inches in the ground on the outside of the fence to prevent rabbits from burrowing underneath.

Well constructed gates, with sound, heavy posts, to prevent the gates from sagging, are essential in order to prevent any entrance of vermin at these places.

Laying Out the Orchard.

Every effort should be made in planting an orchard to see that at the outset it is well laid out, so that it may become an ornament instead of an eyesore to the district in which it is situated. The trees should be so arranged that from all angles the rows will be truly in line.

For all practical purposes the square system is the best. By this system it is not possible to plant so many trees per acre as with other methods, such as the quincunx; but if trees are planted 20 feet apart, 108 trees will be grown to the acre, and it is not wise to tax the land to any greater extent. This fact is evidenced by the extensive root ramification of well-developed trees, the roots of which extend in all directions over the whole area at their disposal when planted as suggested.

To set out an orchard for planting on the square, straight parallel lines equi-distant from each other are marked off, and are intersected by other parallel lines the same distance apart running at direct right

angles. The point of intersection is the position for each tree, as will be seen in the diagram, Plate No. 35.

In starting to peg out the orchard, different systems may be adopted. A method commonly used is to first obtain a straight base line by means of sighting poles about 6 feet long, with white paper wrapped round them to insure easy vision, and by using a rod of desired length to measure distance for pegs. A fairly satisfactory result may be obtained in this way by those experienced in the work, but a better plan is to use a measuring wire instead of the rod, as this insures rapidity and accuracy not possible in the other way.

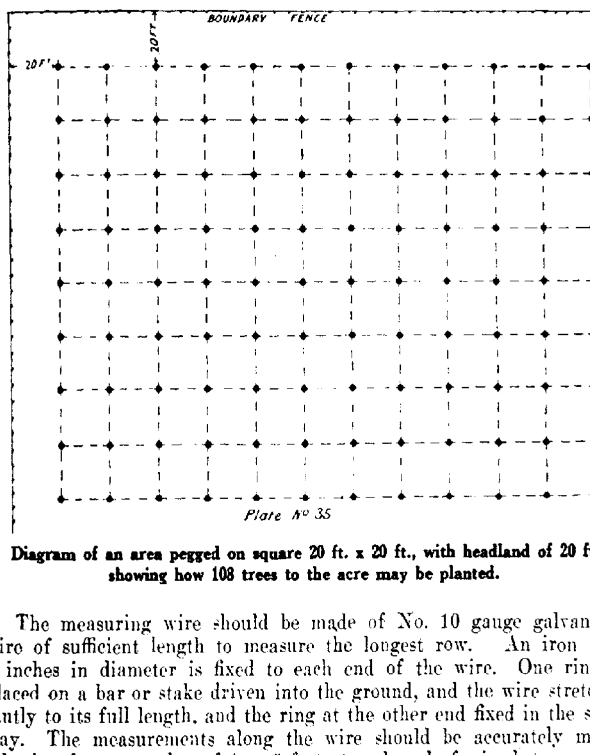


Diagram of an area pegged on square 20 ft. x 20 ft., with headland of 20 ft., showing how 108 trees to the acre may be planted.

The measuring wire should be made of No. 10 gauge galvanized wire of sufficient length to measure the longest row. An iron ring 3 inches in diameter is fixed to each end of the wire. One ring is placed on a bar or stake driven into the ground, and the wire stretched tautly to its full length, and the ring at the other end fixed in the same way. The measurements along the wire should be accurately made, allowing for an overlap of 4 or 5 feet at each end of wire between ring and first mark on the wire. Commencing then at a point, say 4 or 5 feet from the ring, a piece of copper wire is wound round the measuring wire and soldered into position. This plan is continued every 20 feet, or whatever distance between the trees has been decided upon. The use of copper wire for markings is preferable to paint, as the latter is liable to rubbed off, and copper markings will be as readily visible as paint when pegging is being done. In Plate No. 36 an illustration of a planting wire made as described is seen.

With such a wire the base line is easily established. If the headland is to be 20 feet—and it should not be less—the distance decided upon is measured off from the fence and the measuring wire fixed in position. The line may now be pegged off, a peg being driven into the ground at each mark on the wire.

After the base line is established and pegged off, the next step is to place the measuring wire at a direct right angle to the base line already established. Taking the fence as a guide is not always reliable in establising the right angle, but it may be obtained in a simple way by adopting the method generally used by builders and others, *i.e.*, the 3—4—5 principle, as shown in the diagram (Plate No. 37). By multiplying this ratio by twenty we have 60—80—100, which may be more conveniently used in long measurements, and facilitate accuracy.

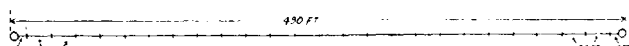


Plate No. 36

Measuring wire marked off at intervals of 20 feet with overlap at each end between ring and first peg-mark.

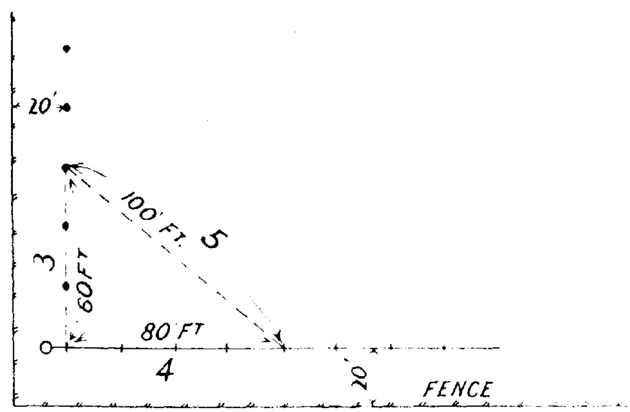


Plate No. 37

3, 4, 5, Method of Finding the Right Angle.

Therefore, after the wire is removed from the base line, already established, it is stretched out and fixed tentatively at an approximate right angle to the base, taking the fence as a temporary guide. If we now measure off 60 feet (fourth peg, including corner peg) on the base line and 80 feet on the measuring wire, the distance between these two on the triangle should be exactly 100 feet. If not correct, the necessary adjustment may be made by shifting the temporary line accordingly. Plate No. 37 shows the details as described.

When the right angle is accurately obtained, the pegging of this line is proceeded with, as in the case of the base line. After this is completed, the other end line and fourth line of the rectangle are completed in the same way. No difficulty should then be experienced in

setting out the remainder of the stakes, as there is a check peg at each end and on each side, as seen in Plate No. 38. Should the land be of an undulating character, it will probably be found necessary to resort to sighting the pegs into their correct positions where decided undulations occur, as in such a case the measuring wire may prove deceptive. It is, however, well to set out as much of the area as possible by means of the measuring wire, and, after this is done, to complete the pegging out of the uneven part of the land by sighting. When the area is inconveniently large, it will be found easier to do the work of setting out in sections, running a line through the centre of area each way to insure accuracy.

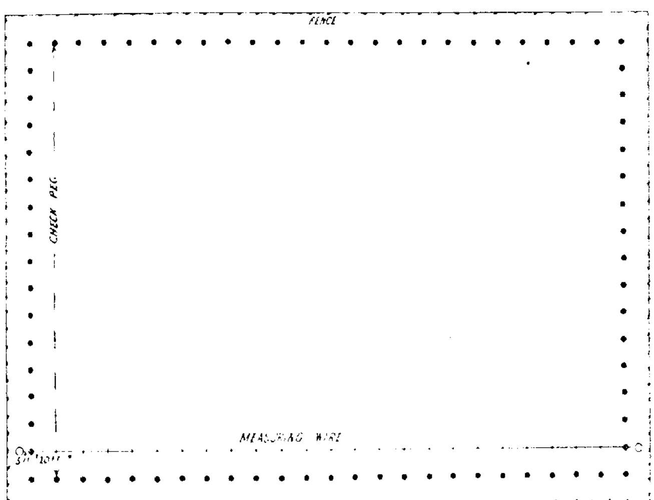


Plate No 38

Showing Method of Pegging-out an Ordinary Rectangular Area.

Selection of Varieties for Planting.

In making his choice of varieties for a commercial pear orchard, the prospective pear-grower should have a definite object in view as to the markets he intends to supply, for indiscriminate planting will do much to make the business of pear-growing anything but profitable. This is so because certain markets have a decided preference for certain varieties. For instance, one variety may be highly suitable for either local or Inter-State trade, but not at all suitable for overseas export, whilst for canning purposes special varieties are required. Thus it will be seen that, in order to cater specially for a particular market, those varieties which are most suitable for the purpose will need to be planted.

Another and important factor to be considered when planting is the matter of inter-pollination, and with some varieties it is quite essential to inter-plant another variety of simultaneous blooming habit in order to secure profitable crops of pears. As this aspect of pear growing is of

such vital importance to insure success in the business, it will be dealt with under its own heading later on in this article.

From statistics of average yields already quoted from other States, and also from America, Victoria need not fear comparison with these places, but the aim of pear-growers should be to maintain, and even increase, the standard in this State.

In regard to quality, the pear-grower is fortunately assisted materially by the climatic conditions obtaining in Victoria, and, therefore, if the right varieties are planted, and subsequently receive the necessary attention in other details of orchard practice, there is little to fear as to the success of the business.

Unfortunately, amongst the earliest ripening pears there is none which can be classed as a good quality pear, and most of them ripen so quickly that they have to be handled very promptly in order to place

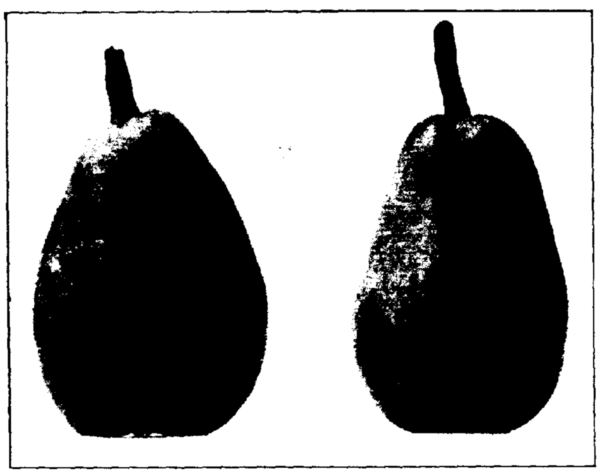


Plate 40.

Clapp's Favourite. **Brockworth Park.**

them on the market. Perhaps the earliest pears of value are Brockworth Park and Clapp's Favourite, the latter being, in the writer's opinion, the better of the two. If picked at the proper time, *i.e.*, when hard and just as the fruit is on the turn from the green to the ripening stage, this variety may be ripened by the third week in January in the south of Victoria, and probably two or three weeks earlier in the northern parts of the State. It is a very handsome pear when ripe, being pale lemon colour, with a rich red blush on the part exposed to the sun. Although not a good keeper, the quality is good, and payable prices are obtained either locally or as a pear for Inter-State trade. Illustrations of the two pears mentioned are shown in Plate No. 40.

Williams' Bon Chretien is perhaps the best known of all varieties, and ripens about two weeks later than Clapp's Favourite, with which it corresponds in type. Souvenir du Congress and Packham's Triumph

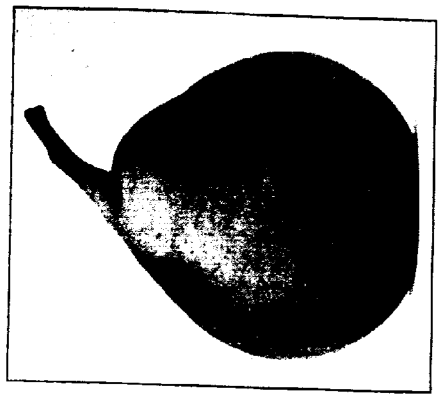


Plate No. 43.—Howell.

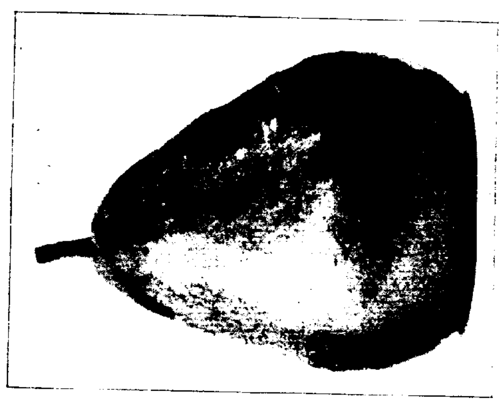


Plate No. 42.—Souvenir du Congress.

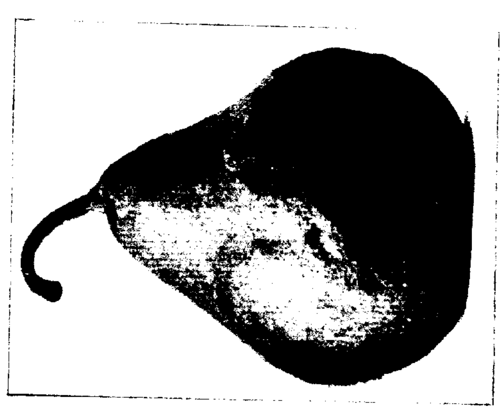


Plate No. 41.—Packham's Triumph.

are also of the same type of pear, and, in fact, by flavour and texture alone, it would be rather difficult to discriminate between any of them, although they differ in appearance and also in their suitability for canning and cool store purposes.

If Williams' Ben Chretien possessed the quality for cool storing of many other varieties, it could be classed as an ideal pear to plant for all markets, but, unfortunately, it cannot claim this distinction. Consequently it should be disposed of while in a hard condition either for canning or dessert purposes. If allowed to become at all ripe, it is often found necessary to sacrifice it at unpayable prices.

Packham's Triumph ripens three or four weeks later than Williams' Bon Chretien, and is a first class dessert pear. It has come into prominence of recent years owing to its fine quality and suitability for cool storing. It should prove a good export variety.

In order of ripening, Howell follows on Williams' Bon Chretien. If picked while it is hard, but just on the turn of ripening, this pear

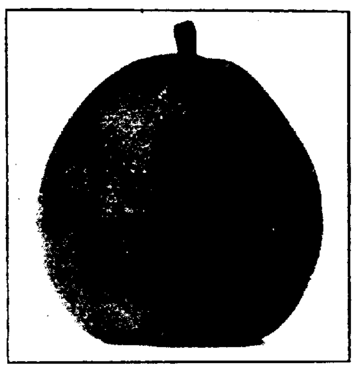


Plate No. 44.—Gansell's Bergamot.

ranks as one of the best for cool storing, but, if allowed to become at all ripe on the tree, soon goes bad in the centre, and is quite unsaleable. If managed in the proper way, however, this pear develops a fine quality, and has proved very profitable for both overseas and Inter-State export trade.

Beurre de Capiaumont is a well-known pear of medium quality, of distinct cinnamon colour, and rather astringent flavour. It is a popular variety for Inter-State trade.

Gansell's Bergamot is a well-known English pear, of good quality. The texture is rather granular, but the flavour is rich and aromatic. It is suitable mostly for local markets. Beurre Bose, Josephine de Malines, and Winter Nelis are three of the finest quality pears grown, and ripen in that order. Each of them is highly suitable for the overseas export trade, and all usually bring high prices late in the season on the Sydney and Brisbane markets. It will be found on referring to the records of prices obtained in previous export seasons that these

pears have proved highly remunerative, and, being good keepers (especially the latter two), they stand the irregular temperatures which may be experienced on the voyage better than most other kinds.

Beurre Clairgeau and Broompark are also good export varieties, and the latter, with Winter Cole, are much in demand for the Inter-State trade. If sent to Sydney and Brisbane in September and October, highly payable prices are generally realized.

A pear that is not very well known, but which is an excellent quality pear, is Beurre d'Anjou. This pear is fast coming into favour, and as it keeps well will doubtless prove a profitable variety to grow. It is an early bloomer, and ripens about the middle of April.

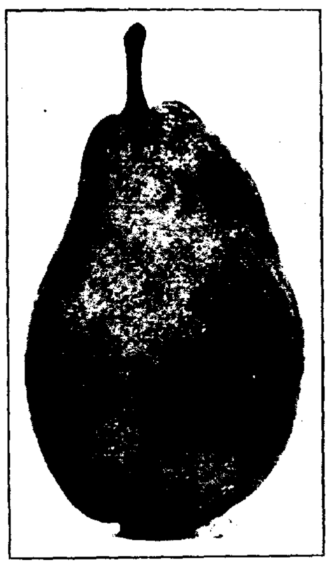


Plate No. 46.—Harrington's Victoria.

Vicar of Winkfield and Harrington's Victoria are two good culinary pears. Although the former does not, as a rule, bring high prices on the local market, it has in the past proved profitable for export. The latter is a Diamond Creek seedling, and owing to its late keeping qualities and suitability for culinary purposes usually brings good prices late in the season.

Black Achan is also a first class pear for culinary purposes, and is very popular for local trade.

Lawrence is another pear not well known, but with its fine, rich, aromatic flavour it is safe to predict that it will become popular in the future. This variety also is an early bloomer, and ripens fairly late.

Kieffer is a well-known variety, singularly adapted for canning purposes, but also useful as a culinary variety. When allowed to ripen it develops a rich pineapple flavour, and the texture, which is coarse when green, becomes fined down considerably, and then makes a good dessert pear. A pear of all-round quality, it is undoubtedly a profitable variety to grow.

In concluding the consideration of individual varieties which the writer considers the best, it should be understood that there are other varieties which also may be ranked as good, but over which those mentioned should take precedence.

The varieties already discussed will be found enumerated in the following table, which will give the reader necessary details concerning each variety, such as time of blooming and ripening, quality, and markets best suited to each variety:—

Variety.	Time of Blooming.	Time of Ripening.	Quality.	Markets.
Beurre Bosc ..	Late ..	Medium	Very good	Local and general export
Beurre Clairgeau ..	Early ..	Medium	Medium	Local and general export
Beurre de Anjou ..	Early ..	Late ..	Very good	Local and general export
Beurre de Capiaumont	Medium	Medium	Medium	Local and Inter-State export
Black Achan ..	Medium	Late ..	Good ..	Local
Broompark ..	Late ..	Late ..	Good ..	Local and general export
Brockworth Park ..	Early ..	Early ..	Medium	Local
Clapp's Favourite ..	Medium	Early ..	Good ..	Local and early Inter-State export
Gansell's Bergamot..	Medium	Medium	Good ..	Local
Harrington's Victoria	Early ..	Late ..	Good ..	Local and late Inter-State export
Howell	Early ..	Early ..	Good ..	Local and general export
Josephine de Malines	Medium	Late ..	Very good	Local and general export
Kieffer	Early ..	Late ..	Good ..	Local, Inter-State, factory
Lawrence	Early ..	Late ..	Good ..	Local
Packham's Triumph	Medium	Medium	Good ..	Local and general export
Souvenir du Congress	Medium	Medium	Good ..	Local
Vicar of Winkfield ..	Medium	Medium	Good ..	Local and general export
Williams' Bon Chretien	Late ..	Early ..	Good ..	Local, Inter-State, factory
Winter Cole ..	Medium	Late ..	Good ..	Local and Inter-State export
Winter Nelis ..	Medium	Late ..	Very good	Local and general export

Doyenne du Comice and Glou Morceau are not grown to any extent in Victoria, but are favourite export varieties in other States.

In making a selection of pears to plant from this list, the market objective is the first consideration. For instance, if the prospective grower intends to grow varieties principally for general export purposes he should choose those kinds which have proved profitable in this branch of the business.

Probably the six best overseas export varieties are:—Beurre Bosc, Beurre Clairgeau, Broompark, Josephine de Malines, Packham's Triumph, and Winter Nelis.

For Inter-State trade:—Beurre de Capiaumont, Broompark, Howell, Josephine de Malines, Kieffer, Winter Cole.

For canning:—Williams' Bon Chretien, Kieffer.

Local market:—General varieties.

Unless the grower specializes in canning varieties under contract to jam factories, he will necessarily have to cater principally for the overseas export trade, or for the Inter-State market, or both, for the local demand for pears, apart from canning, is not in any way comparable with that in the northern States and overseas markets. As, however, we can produce pears of the highest quality in Victoria, it is the pear-

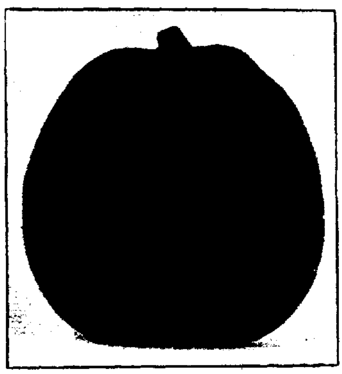


Plate No. 47.—Beurre D'Anjou.

grower's business, not only to cater for, but to also develop, those markets already established.

Dessert pears should not be too large, and should be juicy, sugary, metling and highly flavoured. Culinary pears should be large, juicy, firm, and crisp. For canning purposes it is essential to have varieties which remain white in colour after canning instead of changing to pink or red, as is the case with the majority.

(To be continued.)

THE NECESSITY FOR TOP-DRESSING PASTURES

By Edward Murphy, Dairy Supervisor.

The maximum returns from a minimum of labour are secured in dairy farming where there is a profusion of good meadow grasses to which cows may help themselves. In that stretch of country between Warrnambool and Port Fairy such rich grass lands are to be seen, and it is in about the centre of this area—at Dennington—that the Nestle Company has its huge condensery, which is fed by milk depôts in the surrounding district. Some idea of the quantity of milk treated at the condensery is given by the fact that its annual requirement of sugar is about 9,000 tons, and another condensery is about to be constructed for the Nestle Company at Allansford.

No. 1.—The Farmstead, Nestle's Concentrated Milk Company, Dennington.

A great deal of the surrounding district was at one time considered unsuitable for dairy farming, but it has been shown that it can be made productive by the use of phosphatic fertilizers. Unfortunately, this improvement is restricted to a comparatively limited area, and on big tracts of country the pasturage has, owing to neglect and bad management, deteriorated. Though these areas cannot compare in natural fertility with the land at Dennington and Tower Hill, they could, by attention to the underlying principles of growth, be transformed into good dairying land.

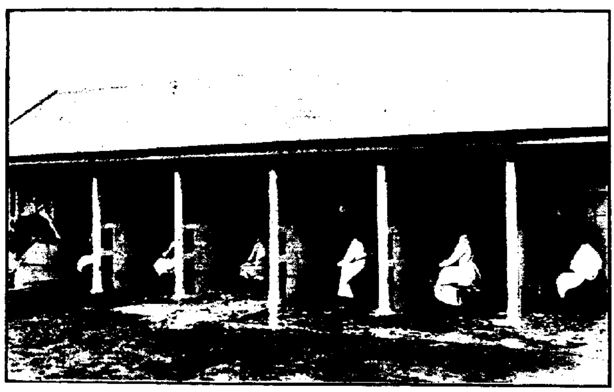
Compared with other countries, much of the Australian surface soil is weak in lime and phosphorus, or in phosphorus only. In consequence, grasses have become predominant in which the content of such minerals is low, and on such grasses milch cows cannot maintain a proper balance of the essential elements in their systems.

To keep their cows alive, many farmers resort to laborious hand feeding instead of improving their pastures by top-dressing them with phosphate. Nothing is so costly as ignorance, and at Hamilton it has been the cause of a fair-sized butter factory dwindling away to a small cream depôt for a metropolitan firm.

Merely spelling the fields will not suffice. Graziers often tell me that their paddocks will grow only " dead " grass, on which cows get paralysis

and sheep become weak and liable to worms. Regulation of the grazing on these depleted soils can only avail in so far as it promotes the growth of deep-rooting grasses in order to tap the reserves of mineral nutrients in the subsoil. The growth of such plants does not readily come about while the surface of the soil is unfavorable to their re-establishment.

The Department of Agriculture is conducting some trials in top-dressing natural pasture on a block close to Hamilton, which will be fully reported at a later date. At the commencement of the trials, the grass in the lower end of the plots was tufty, long, and harsh. On the untreated portion, it is still the same, but where lime and superphosphate have been applied, the tufts have turned green to the very tips, and the growth of trefoil and clover has been astonishing. On the untreated soil, a few feet away, one has to look very closely to see any clover or trefoil. This experimental block is part of a holding upon which milch cows did very well forty years ago, but of late years there have been losses, and cows can only be kept alive by liberally feeding bran and



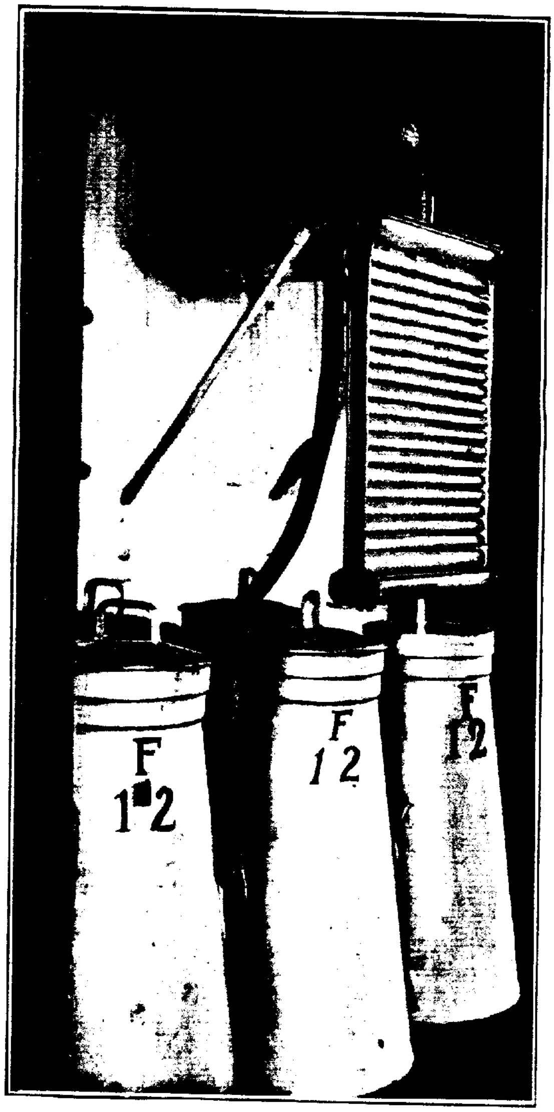
No. 2.—The Cowshed at the Nestle's Concentrated Milk Company's Farmstead.

bonemeal to them. Fifty years ago, there was plenty of clover all about Hamilton; now there is scarcely any.

The rearing of animals and the growing of crops for market exhaust the farm of phosphates, and, where the land is weak in this respect, the deficiency should be supplied, otherwise the land will be fit only for fattening store stock.

The ash of plants is only about 2 per cent. If the available stock of mineral nutrients in the soil falls below this amount, and we neglect to replenish it, then we restrict the supply of wealth from the air and sunshine. The greater bulk of the plants comes from the air and rain, and the transformation is induced by the energy from the sunshine, so that, when the growth of green blades is promoted, we literally harness the sun.

At Dennington the natural conditions favour such cycle of changes in the highest degree. Within a handy radius of the centre a large supply of milk is obtained. All the operations of the Nestle's firm are governed by pure business considerations. The suppliers must have



No. 3.—The Cooler at the Nestle Concentrated Milk Condensery, Dennington.

It has been forced home upon the dairy people of this district that it pays to be scrupulously clean, and the spirit of emulation has been aroused, so that numbers of the dairy folk now vie with one another in endeavouring to have the most perfect hygienic conditions. Illustration No. 2 shows a well-kept cow-shed.

The view of the cooler may serve as a reminder to many dairymen who are very remiss in the important matter of aerating and cooling milk or cream. Many taints are caused in dairy products by volatile substances which will pass off if the milk is exposed to the air. The cooling retards fermentation, and as there are cheap and effective coolers on the market, every dairyman should have one.

No. 4.—Limestone Cliffs at the Mouth of the Hopkins River.

Throughout the Dennington districts, limestone crops out on every hillside. There are great cliffs of it at the mouth of the Hopkins River. Near Allansford, there is a different class of country, with heathy sands, loams, and clay beds and ironstone gravels. Hereabouts, it has proved very profitable to top-dress the grass paddocks with the phosphatic fertilizers.

Fertility of soil depends to a large degree upon the activity of soil bacteria. Available mineral nutrients are essential to them, as to all the higher forms of life. Lime affects the chemical state of the soil and favours the presence and increase of the nitrifying bacteria. Phosphorus is essential for their vitality and activity. Therefore, the application of lime, phosphorus, and sulphur not only means the direct supply of plant-food, but the unlocking of held-up stores, and the gathering of more from the soil-air.

The milking cow is a machine, and must be supplied with the necessary fuel in the required proportions, and if she is to perform her

maximum in the way of putting the fat of the land into the bucket, she must have a ration balanced in *all* of the nutrient elements, including the hitherto neglected ash.

Mr. James Burleigh has 320 acres of land at Nirranda, a district now regularly traversed by milk-waggons from Dennington. The ground is just nicely undulating, and the soil varies from a moderately stiff loam on the lower ground to a sandy or gravelly nature on the rises. Illustration No. 5 gives a view of scrub adjoining Mr. Burleigh's holding, about 30 chains from his house.

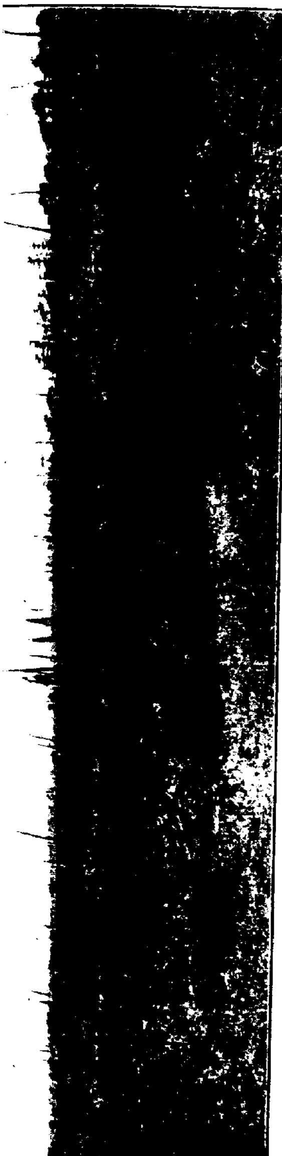
Illustration No. 6 gives an idea of the untreated field, which has been partly cleared. The timber is a poor messmate, and the undergrowth is prickley mimosa and bracken ferns. When Mr. Burleigh took over this property from his father nine years ago, the place was rather rougher than this paddock of 120 acres is now.

No. 5.—View of Scrub Paddock thirty chains from Mr. Burleigh's House.

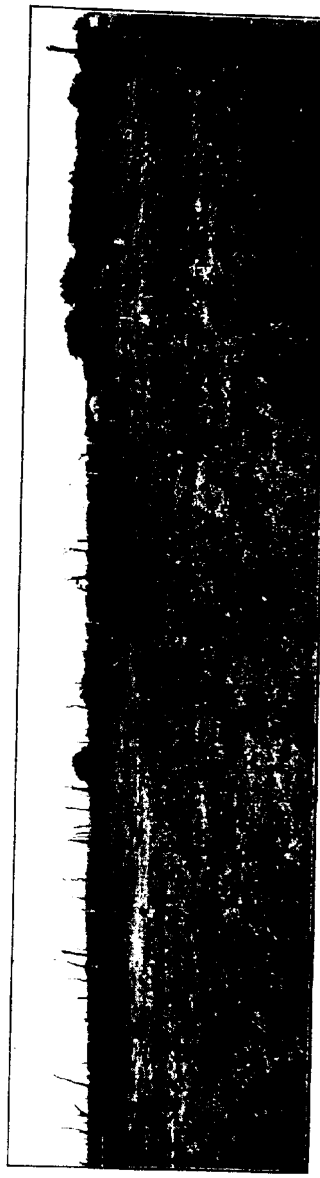
At that time, about sixteen cows was as much as the farm would carry, and they were very unthrifty, with frequent losses from paralysis. At present, 80 cows can be kept, and kept well. Then the income from cream was £104; now it is £834. Only 53 cows were milked this year on account of labour difficulty.

About 20 acres were cleared and ploughed each year. One or two cereal crops were grown with the aid of 1 cwt. of bonemeal per acre, and then a mixture of grasses was sown, followed by a top-dressing of 1 cwt. of Mount Lyell grass manure per acre. Subsequently, 80 lbs. per acre of bonemeal was broadcasted on by hand each season until two years ago, when a change was made to superphosphate.

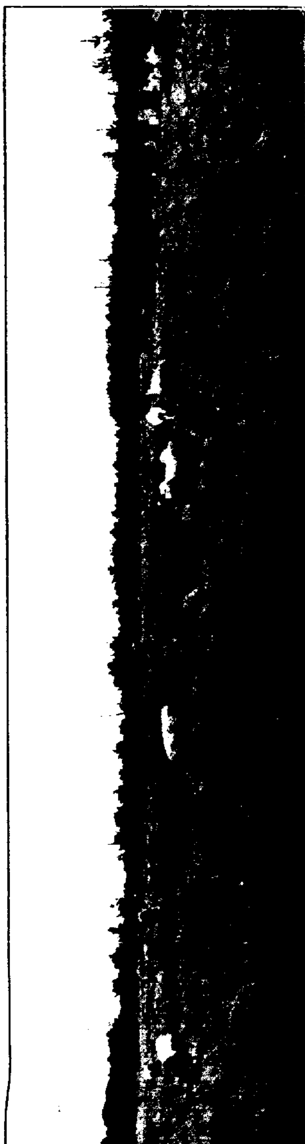
The results from the use of superphosphate alone vary considerably. On the sandy loams and the black flats, it is quite satisfactory, but is not so on the ironstone formations, *i.e.*, the buckshot gravels. In the absence of lime, it probably forms unfavorable compounds with the



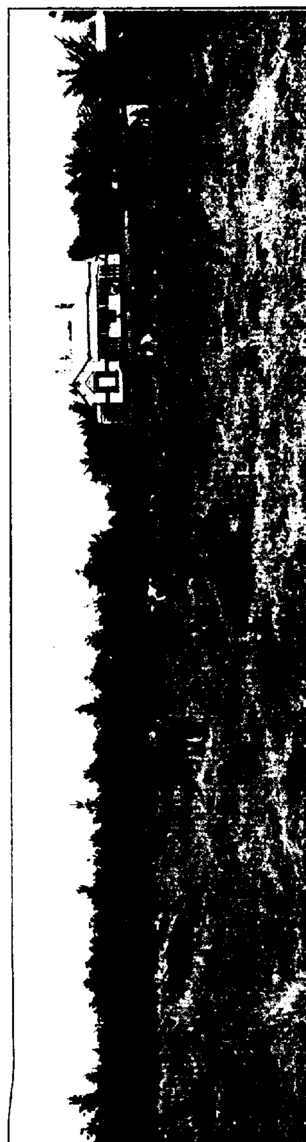
No. 6.—Untreated Field in which Cows Die of Paralysis.



No. 7.—Mr. A. Mathieson's Paddock.



No. 8.—Cows in the Healthy Meadow.



No. 9.—The Burleigh Homestead.

iron, and sulphate of iron is fatal to the nitrifying bacteria. On such soils, better results are obtained by using the less soluble basic phosphates. Sorrel becomes very pronounced on these ironstone soils after using superphosphate only. Liberal liming is a necessary accompaniment of the use of superphosphate on such soils.

The paddock shown in No. 7 view is occupied by Mr. A. Mathieson, and it adjoins Mr. Burleigh's land. This field has had a light dressing of 80 lbs. per acre of superphosphate for each of the past six seasons. No clearing was done, and the only other treatment was a rough harrowing each time. The grass has become thicker, while the bracken ferns have thinned out. Previously, eight miserable cows were grazed on this paddock, but to-day it keeps 36 in the best of condition, and the monthly cream cheque has increased from £10 to £80.

The grass paddock shown in illustration No. 8 was sown down seven years ago. There is now plenty of good, sweet herbage there, and the cows look well. In this field, at the time of my visit, there were to be seen quantities of those dark-green circles in the grass known as "fairy rings," which are believed to be due to the after effects of fungoid activity promoting nitrification and unlocking fertility. The rugs on the cows indicate that the owner has a keen regard for business, and conserves the energy and heat of his cows so as to obtain a full measure of butter-fat. The rows of shelter trees about the farm are further evidence of sound judgment and good taste.

The prosperous-looking and picturesque homestead may be taken as a criterion of the management. A complete answer is here given to those farmers who say that they cannot afford to buy fertilizers for their pastures. The *facts* rather show that they really cannot afford to do without them. Mr. Burleigh was determined to succeed, and, though he was carrying heavy financial obligations, bought manure for his paddocks, and slowly improved them. The tree-planting and top-dressing were the scorn of the neighbourhood; but such did not deter him, and now he has the deep pleasure of having set a good example.

A brother has made a success of a block close by, on which thirteen former occupiers had failed. This success was made possible by using phosphate for the pasture. Three miles nearer Peterborough, Messrs. Hickey Brothers have a farm on good-looking black flats, similar to the flats near Hamilton. The milch cows did very well here for a number of years, and then they lost their bloom, and began to go back and back. A few years ago, a dressing of superphosphate of about 80 lbs. to the acre was tried, and has been repeated each year since. The bone chewing, which had become very common among the cattle, has ceased, and though twice the number of cows are now kept, individually they are much more productive.

Nearer Terang, the cows owned by a dairyman showed improvement when he allowed them to drink whey brought from the local cheese factory, and for which they showed a strong liking. The great advantage to their owner through the cows' better health is further supple-

SOME FRENCH SWEET WINES.

By F. de Castella, Government Viticulturist.

In an article contributed to this journal in February, 1915, the writer advocated the making of sweet wines of lower strength than the Muscats and so-called Australian Ports, which constitute so large a proportion of the wines locally consumed. Three types were mainly dealt with, viz., Sauternes, which owes its fruitiness to over-maturity of the grapes and the judicious use of sulphurous acid; the yeast starvation wines, such as Clairette de Die and Blanquette de Limoux, and Hungarian Tokay or Tokaj. It was shown that three principles contribute, either singly or in combination, in the making of these sweet wines of moderate alcoholic strength or sweet delicate, as they were formerly termed, viz.:—

1. Over-maturity of the grapes, and fermentation at a low temperature.
2. Yeast starvation.
3. Judicious use of sulphurous acid.

It was hoped that drawing the attention of winemakers to this class of wine might lead to the conducting of experiments on a commercial scale, and ultimately to the placing on the local market of sweet wines of moderate strength. It is to be regretted that so little has as yet been attempted in this direction.

In suggesting such experiments, it is certainly not intended to discredit the sweet wines we now produce, and in which we have often reached a very high degree of quality; wines made in similar manner and of similar type to the celebrated Ports of the Alto Douro (Portugal), which rank, in the opinion of all good judges, among the world's finest wines. Nevertheless, the production of sweet wines of lesser alcoholic strength should appeal to our winemakers, if only on financial grounds, in view of the present high price of fortifying spirit, and the increased excise duty on same. The average Australian consumer insists on getting a sweet wine. If this taste can be satisfied with a wine containing 24 to 26 per cent. of proof spirit instead of 34 per cent., it is obviously better for the pocket of the producer and the health of the consumer.

It is true that these less alcoholic sweet wines do not possess quite the same "robustness" as wines of higher strength; they are somewhat more difficult to make satisfactorily, and when made they require more careful handling than the wines we now so largely produce, and which are made in quite similar manner to the true Ports of the Alto Douro. In order to make the lighter wines on a large scale, it is probable that some alterations and additions will need to be made to our wineries, mainly in the direction of more complete temperature control. An ice-making plant is an indispensable adjunct in breweries and butter factories; why not also in wineries? It is obvious that, if moderately alcoholic sweet wines can be safely made and satisfactorily handled in France and other countries, the same can be done here, though special conditions, due to our climatic differences, must be reckoned with.

Sauternes and Tokay are expensive luxuries beyond the reach of the average wine drinker. What is wanted here is something more

modest, and there are several other sweet wines made in France the study of which should prove of interest to our winemakers. The consumption of sweet wine in France is quite insignificant in comparison with that of light dry wine,* which constitutes the every-day beverage of the whole population; nevertheless, several small districts have for centuries specialized in the making of other types, and some of these have long been celebrated for their sweet or dessert wines—wines which scarcely ever contain more than 26 per cent. of proof spirit as compared with 35 to 38 per cent. proof for Port, and about 33 per cent. for Sherry. Port and Sherry, though recognised to be choice wines, do not find favour with the temperate Frenchman, who finds them too potent. He prefers wines of one or other of the types about to be described on the few occasions when he takes a glass of liqueur wine after dinner.

In the present article it is proposed to describe a few additional French sweet wines, and to briefly outline the method followed in the making of each. As will be seen, these often differ widely; there is no standardized or uniform method of making such wines. Though containing only about 26 per cent. of proof spirit, and even less, these maintain excellent condition, and are regularly handled in commercial quantities. There can be no doubt as to the possibilities in a similar direction in Australia.

It is certainly not suggested that the types of wine about to be described should be servilely imitated; let us by all means evolve new types of our own. The object of this article is to point out that there exists in Europe a wide range of sweet wines of moderate alcoholic strength of types quite different to any now made in Australia. The practical application of one or other of the methods followed in making such wines, or possibly a combination of several, will no doubt permit of the placing on the local market of wines of a type or types as yet unknown here, but types which should, owing to their smaller alcohol content, be at the same time more economical to produce, and more hygienic than our present-day sweet wines—two inducements which cannot fail to recommend themselves to thoughtful winemakers.

Australian makers of sweet wines very generally follow the Port wine method of the Alto Douro, which may be briefly summarized as

* According to French official statistics for the 1914 vintage, the last for which similar figures appear to have been published, the 3,765,816 acres under vine in bearing yielded 1,316,849,138 gallons, classified according to alcoholic strength as follows:—

Wines of less than 11° (19·19 per cent. proof)	1,209,585,564	gallons
Wines of 11°	74,113,622	,,
Wines of over 11°	33,149,952	,,
Total ..	1,316,849,138	,,

The above figures are for France alone, exclusive of Corsica and Algeria. It will be seen that only 2½ per cent. of the total wine production of France consists of wine containing more than 19·19 per cent. proof. Exact figures as to sweet wine are not available, but much of the wine over 19·19 per cent. proof is dry wine; it thus follows that the proportion of sweet wine made in France cannot be much above 1 per cent. of the total wine production.

The proportion of choice wines to "Vin ordinaire" is also interesting. For the 1914 vintage it is estimated to have been as follows:—

Choice wines, worth over 50 fr. per hectolitre (1s. 9¾d. per gallon) at the vineyard (since 1914 wine values have more than doubled in France)	27,348,134	gallons
Vin ordinaire	1,289,501,004	,,
	1,316,849,138	,,

"Vin ordinaire" is consumed when quite young. At the 1914 vintage stocks of older wines in France only amounted to 125,830,012 gallons, or scarcely 9½ per cent. of the incoming vintage.

allowed to proceed until the gravity is reduced to 4 or 5 degrees Beaumé, when it is entirely arrested by the addition of sufficient spirit to raise the alcohol content to from 32 per cent. to 35 per cent. proof. The stage at which the fermenting must is pressed from the crushed grapes varies according to the intensity of colour which is required—sometimes the skins are separated immediately after crushing and stemming, and before the start of fermentation; but, in the majority of cases, the must ferments on the skins, from which it dissolves colour, tannin, &c., for a period varying from 24 hours to several days. Subsequent clarification is mainly spontaneous, though filtering and fining are often practised.

This method presents several practical advantages. The sudden raising of the alcohol strength immediately paralyzes yeasts and bacteria alike; alcoholic fermentation ceases, and the development of injurious bacteria—secondary fermentations, as they are often termed—is likewise avoided. The wine remains sweet, and it also remains sound.

The most striking difference between this method and those followed by French sweet winemakers is to be found in the moment at which the spirit is added.

In the Port method the whole of the spirit is added at the conclusion of useful fermentation—in other words, when all but the remnant of sugar which it is desired to retain as such in the wine has been transformed. The cessation of fermentation is sudden and complete.

The procedure is radically different in the case of most French sweet wines. The addition of spirit is made at the commencement instead of at the close of fermentation. The cessation of this action is no longer sudden and complete, but slow and gradual.

Many French authorities are of opinion that the early addition of spirit leads to the cessation of fermentation at a lower strength than is possible with fortification at a later stage. According to Bouffard, for example, the addition of sufficient spirit to bring the strength to 12 to 14 per cent. absolute alcohol (21 to 24½ per cent. proof spirit), provided it be made before there are any apparent signs of fermentation, will suffice to impound the whole of the natural sugar of the grape. Once fermentation has started, however, it will not be arrested until a strength of 18 degrees (32 per cent. proof) has been reached; such strength being the sum of the added alcohol, plus that produced by the fermentation of portion of the sugar of the must.

As will be seen below, many French sweet wines no longer show any tendency to ferment, though their strength does not exceed 26 per cent. proof (15 degrees absolute alcohol by volume). This may surprise many of our winemakers, who generally find fortification to over 30 per cent. proof to be absolutely necessary in order to arrest fermentation. The explanation is to be found in the early stage at which the spirit is usually added.

It must also be remembered that French sweet wines ferment at lower temperatures than do ours. Even Frontignan has a cooler climate than Rutherglen, and in order to attain the requisite degree of over-ripeness, the gathering of the grapes must be long delayed—so long that frosts, and even falls of snow, are not uncommon in some parts of

France when the sweet wines are vintaged. "Fermentation must be slow, and never tumultuous; it should take place at the lowest temperature at which fermentation is possible, commencing at 20 degrees C., and later at 17 degrees C."* Artificial refrigeration would certainly enable wine to be made and handled on the Murray under exactly similar temperature conditions to those prevailing in France; and in a winery equipped with an ice-making plant, sweet wines with only 26 per cent. proof spirit could be made as easily as in that country. The ice plant is not, however, indispensable, since with the assistance of the other two factors, viz., yeast starvation and the use of a little sulphurous acid, sweet wines of 26 per cent. can certainly be made, and this at the temperatures usual at vintage time on the Murray. On the other hand, our warmer climate gives us greater facilities for vintaging over-ripe grapes; and these are indispensable in order to make high-grade sweet wines. In some French districts, especially in certain seasons, it is difficult to obtain the desired degree of over-maturity, and various devices must be resorted to. One of these consists in twisting the stalk, without, however, severing the bunch from the vine, on which it is allowed to hang for a week or so longer. Sometimes the grapes are gathered when as ripe as possible, and allowed to become over-ripe on trays or on shelves covered with straw, in a dry, well-ventilated shed, hence the name *Vin de paille* (lit. straw wine), given to some celebrated sweet wines made in the cold Jura district of France.

Even in Northern Victoria a few seasons will be remembered when ripening was not so satisfactory as usual—devices such as the above could have been applied with advantage. Even more satisfactory should prove partial drying for a day or two on wire-netting racks, such as are now so largely used at Mildura, &c., for drying sultanas and currants.

French Muscats.†

French viticultural writers have long been legitimately proud of their Muscats, of which they speak with poetic enthusiasm. Muscat De Frontignan was described by Alphonse Daudet as "the king of wines and the wine of kings." Outside of France these wines are not so well known; their production being limited they are not exported to any extent. They differ from the muscatels of Portugal and southern Spain, which are much more similar to ours, by their paler colour, greater delicacy, and lesser alcoholic strength.

In 1868 the four most celebrated Muscat growths in France were Rivesaltes, in the Department of Pyrènées Orientales; and Frontignan, Lunel, and Maraussan, in Herault. There were numerous growths of lesser celebrity such as Montbazin, Cazouls, Marseillan, Béziers, &c. The wines of the last two localities were at one time blended with those of Frontignan.

The quantity of Muscat made in France has never been very considerable. According to H. Marès (*Livre de la Ferme*, vol. II., p. 190), before the destruction of Herault‡ vineyards by phylloxera, the Muscat vineyards in that Department occupied 2,000 hectares (nearly 5,000 acres), whereas the vineyards cultivating other sorts occupied no less an

area than 150,000 hectares (370,650 acres). Herault produces more Muscat than any other French Department. Since reconstitution, the Muscat area is considerably less. This applies not only to Herault but to the whole of France. The unfair competition of the imitation wines of *Cette* had a good deal to do with the reduced area, but it must also be remembered that in the early days of reconstitution wine was in such demand and prices so high that the Muscat districts were mainly replanted with heavy-bearing sorts, yielding *vin ordinaire;* nevertheless, Muscats are still produced, though in smaller quantity, and it appears as though many of the old Muscat vineyards will ere long be replanted. Though the produce of these vineyards is choice, their yield is poor. In pre-phylloxera days it was estimated to be about 100 gallons per acre (H. C. de Leusser). Though the method of making the wine differs somewhat from one vineyard to another, Frontignan may be taken, in a general way, to represent all these French Muscats. It is one of the oldest districts producing such wines, and is the one which is best known outside of France. In Charlemagne's time Frontignan already exported Muscats. In the thirteenth century this part of France belonged to James I., King of Aragon, who thought so highly of his Muscat wines that he visited each Frontignan vintage to personally supervise the making of the wine. The reputation of these wines was zealously guarded by the authorities. Many queer edicts were issued in the sixteenth and seventeenth centuries, with a view to keeping the quality up to the highest possible standard. Blending with cheaper wines from adjoining districts was prohibited, as was the manuring of the Frontignan vineyards, lest quantity should be forced to the detriment of quality. The date for commencing vintage was also fixed the owners being debarred from picking their grapes until, in the opinion of the authorities, a proper stage of ripeness had been reached

Frontignan, which has given its name to the surrounding district, is a small town situated some 14 miles south-west of Montpellier, and quite close to the sea shore. The Muscat vineyards occupy the flanks of the range of hills known as La Gardiole, which rise to a height of nearly 500 feet above the Mediterranean. On these well-exposed, sunny slopes over-maturity of the grapes is easily obtained. The soil varies somewhat. A portion of it is alluvial, of quaternary geological age, but the greater part is of miocene (tertiary) age. Both types are fairly gravelly, about 30 per cent. of the whole soil consisting of stones and gravel. The lime content is considerable. It reaches, in places, as high as 70 per cent., expressed as carbonate (=39.2 per cent. as lime, C_aO). These soils are remarkably rich in phosphoric acid. The vines are trained goblet or gooseberry style, and pruned to spurs with two eyes each. As is usual in Herault, they are neither staked nor trellised, nor are they summer pruned in any way.

The Muscat Grape.

The variety grown is the White Muscat, generally known by the name of Muscat de Frontignan, but which has many synonyms. This vine is now quite familiar to vine-growers in north-east Victoria, owing to extensive plantation made with vines of this variety, imported from France in 1909 and 1910. Rutherglen growers, who ordered these as grafted rootlings, were under the impression that the White Muscat of Frontignan was merely a colour variation of the vine which has long been popular in north-east Victoria under the name of Brown Muscat.

The opinion of older French authorities seemed to justify this view. Marès, for example, describes a Muscat with violet fruit, grown to a limited extent near Frontignan, which yields a "very choice and much appreciated rose coloured wine." There is also a Black Muscat in southern France, not really black, but dark reddish brown. These seem to be merely colour variations of the White Muscat of Frontignan, which is preferred in that district "owing to the fine amber colour of the wine it yields."

Our Australian Brown Muscat "sports" considerably as regards the colour of its fruit. It is not uncommon in Rutherglen vineyards to find odd vines with fruit varying from nearly white to so dark a red as to be almost black.

When the imported White Frontignan fruited, a considerable difference was soon noticed between the wine it yields and that of the Brown Muscat. The former, though fragrant and delicate, lacks the fullness, body, and very pronounced Muscat character of the latter.

It is not possible, at this stage, to decide with certainty what our Brown Muscat really is. It has long been grown in Australia, and certainly was imported very many years ago. The writer is of opinion that it is probably identical with the Portuguese Muscat, somewhat extensively grown in the Alto Douro, and also at Azeitão, near Lisbon, under the name of Muscatel Roxo. It is known in France as *Muscat rouge de Madère* (red Madeira Muscat), and is looked upon as distinct from Frontignan and the other French Muscats described above.

There are, in reality, a very large number of Muscat varieties differing more or less considerably from one another. V. Sebastien* classes them in three distinct groups, as follows:—

I. Varieties with a simple or pure Muscat flavour.
II. Varieties with an attenuated Muscat flavour, reminding of raisins.
III. Varieties with Muscat flavour, and with a perfume of orange blossom.

He looks upon White Muscat of Frontignan as the type of the first group, into which he also places early White Saumur Muscat, Muscadelle of Sauternes, and the Violet and Red Madeira Muscats. The last two, which are identical in all but colour, are probably the same as our Brown Muscat.

The second group comprises all the table Muscats, of which the type is Muscat of Alexandria, or Roman Muscat, with all its numerous subvarieties: Gordo Blanco Moscatellone of Piedmont; Salamanna of Tuscany; and Zibibo of Sicily (Zebibo in Arabic signifies raisin). Into the identity or otherwise of these sorts it is not necessary to go here. The question has given rise to much discussion, and is by no means settled.

The third group has for type the variety known as Orange-flower Muscat or Muscat de Jesus. The fruit is very delicately perfumed, though the Muscat flavour is less pronounced than in our Brown Muscat. This vine should yield very delicate and fragrant wines, although the Muscat flavour is perhaps scarcely powerful enough for this market.† The variety from which French Muscats are made is almost exclusively White Frontignan.

* Leo Vins de Luxe, 1897.

† There are a few individual vines of this sort at the Rutherglen Viticultural Station, but they have not yet yielded enough to make it worth while crushing them separately.

... end of September or commencement of October (March and April in Australia). The following figures as to date of vintage and gravities are given by Chaptal and Hugues:—

Year.		Date of Vintage.		Degrees Beaumé.
1910	...	22nd Sept.	...	15° to 18°
1911	...	28th Sept.	...	18° to 21°
1912	...	25th Sept.	...	19° to 22°

The grapes are crushed and pressed immediately, fermentation not taking place on the skins. The separated juice is then made into wine, according to one or other of two quite distinct methods, giving different results as regards the character of the wine, and also the treatment extended to it by the French Regie (Department of Customs and Excise). These are:

1. The Mistelle method.
2. The natural sweet wine method.

The Mistelle Method.*

Wines of this type are made by the immediate addition to the must of 15 per cent. of absolute alcohol before the start of fermentation.† This addition must be made immediately after the separation of the juice from the skins, and with the least possible delay. The thorough mixing of the alcohol with the must is somewhat difficult to effect, owing to the different density of the two liquids. Very energetic stirring is necessary.

Wines thus checked possess a very pronounced Muscat aroma. They acquire refinement (*finesse*) with age, whilst at the same time retaining the characteristic flavour of the grape. They are considered by the Regie (French Customs and Excise) to rank as *vins de liqueur*.‡

The Natural Sweet Wine Method.

Wines having the right to the term "natural sweet wine," and to the fiscal privileges this conveys, are defined by the French laws of 13th April, 1898, and 30th January, 1907, as follows:—These wines must be produced on the premises of the grower by the addition of alcohol to natural grape musts containing at least 14 degrees of alcohol, actual or potential (*acquis ou en puissance*). The quantity of added alcohol must not exceed 10 per cent. (absolute, by volume). The consumption tax on the added alcohol must be paid, but subsequently these wines are subject to the same fiscal treatment as ordinary wines.

The method of making the wine is as follows:—The must, which must comply with fiscal requirements, as above, is allowed to ferment spontaneously. As soon as the fermenting liquid has reached an alcohol strength of 5 degrees (8.7 per cent. proof), alcohol is added in quantity determined by calculation as sufficient to raise the strength of the mixture to 15 degrees; in other words, an addition of 10 per cent. of

* Mistelle is the French version of the Spanish term "Mistela," a name given in Spain to wines which have remained sweet owing to stoppage of fermentation by addition of spirit. In France the term is usually limited to a sweet wine, the alcohol content of which is wholly added spirit.

† This would be equivalent to fortifying at the rate of 19¼ gallons of 60 over-proof spirit to each 100 gallons of unfermented must. It would immediately raise the strength to 26·2 per cent. proof.

‡ Vins de liqueur receive less favourable treatment than natural sweet wines from the French Regie (Department of Customs and Excise). In addition to paying the consumption tax on the fortifying spirit they pay a special excise duty and are subject to further restrictions when retailed.

This fortification paralyses the work of the yeast, and arrests fermentation. This checking (*mutage*), which is not always perfect, is completed by running the wine into sulphured casks.

In addition to preferential fiscal treatment, this method presents other advantages, several fermentation products develop in the wine, notably, glycerine, volatile acids and esters, which, with age, develop special flavours which are much appreciated, amongst others, the Rancio taste. Rancio taste or *gout de Rancio* is a special nutty flavour, reminding of both Port and Madeira, which develops in certain wines as the result of oxidation. It is usually accompanied by a change to a tawny colour in a red wine.

Whether made according to the first or second of the above methods, subsequent handling is practically the same in each case. When the first cold days of winter have brought about sedimentation of the heavy lees the wine is racked. During the first and subsequent years several rackings are given annually to clear and improve the wine. It is only after three years' storage in wood that the Muscat wine is marketed. In order to obtain perfect condition it is necessary to fine and filter before bottling.

Chaptal and Hugues describe Muscat de Frontignan as—

> "A very choice dessert wine (*un grand vin de dessert*); its alcoholic strength reaches 15 degrees (26.2 per cent. proof). It is of a golden-yellow colour, and has a bouquet and taste of musc peculiar to it. In order to acquire all its quality it needs at least three years' storage in cask; after this, under the influence of age, the flavour of musc diminishes, the colour lightens, and the wine possesses that smoothness and remarkable refinement of flavour which is not possessed by the Muscats of Eastern countries, and which cause it to be classed in the first rank of liqueur wines."

In Viala and Vermorel's *Ampelographie* a long article is devoted by P. Gervais to White Muscat of Frontignan. The following are extracts from the part which deals with the making of the wine:—

> Although ripe about 20th August, the Muscat grapes are not vintaged until the end of September or beginning of October, by which time they have attained extra maturity and a maximum of sweetness. Picking is delayed until rather late in the morning—until fog and dew has dried off; several pickings are practised, only the ripest grapes being gathered at each. The grapes are pressed immediately, and the must is placed in *demi-muids* (puncheons of 75 gallons or over), and fortified by the addition of 3 or 4 degrees of alcohol distilled from wine (equivalent to 3.3 to 4.6 gallons of 60 o.p. spirit, to each 100 gallons of must). This addition is made with a view of paralyzing ferments rather than of increasing the alcoholic strength. Fermentation should proceed very slowly; this is favoured by shaking the puncheon filled with fermenting must at irregular intervals. Sometimes it is found necessary, during the course of fermentation, to add 1 or 2 degrees additional spirit,* in order to retain sufficient sweetness.
>
> When the grapes are first crushed the must usually registers 18 deg. Beaumé, sometimes it exceeds 20 deg. Such vintages are great growths, really remarkable for their sweetness and smoothness. When fermentation has ceased, or almost so, the wine is racked. Rackings are repeated during the course of the first year to separate the wine from the relatively abundant lees which form each time. When clarification is complete, the wine can be bottled. It keeps indefinitely in bottle, in which it only loses any of its qualities after a very long time. The taste of musc diminishes and the wine becomes less syrupy; it still preserves that refinement and smoothness (*moelleux*) and that special aroma which place it in the first rank of liqueur wines.

* 1.1 to 2.2 gallons of 60 overproof spirit to each 100 gallons of must.

The following analyses will give an idea of the usual composition of French Muscats. Though there is considerable variation, both in sweetness and alcoholic strength, it will be seen that the latter is always moderate. The strongest wine contains just under 27 per cent. proof, whilst many of the samples contain much less—even as low as 20 per cent. proof—and yet these wines maintain their condition satisfactorily. With few exceptions, the sweeter the wine the less alcohol it contains. This is in accord with Rutherglen experience; wines made from very over-ripe grapes have been known to retain their sweetness and remain sound, though little or no alcohol was added. There seems to be a tendency of later years to use more spirit than formerly. The more recent wines usually contain rather more alcohol than older vintages.

The sulphate of potash content, and also that of sulphurous acid (SO_2), though well within the limits of pure wine legislation, are rather higher than is usual in ordinary table wines, indicating a certain amount of sulphuring (or its equivalent) during the making and handling of the wine.

Analyses of Several Samples of Muscat de Frontignan Quoted by Chaptal and Hugues.

	Made according to "Mistelle" Method.		Natural Sweet Wine.	
	Vintage, 1911.	Vintage, 1912.	Vintage, 1911.	Vintage, 1912.
Gravity, degrees B.	11·5	12·5	9·2	9·0
Alcohol, as proof spirit, per cent.	26·2	26·9	26·2	26·0
Sugar, per cent., as Glucose	25·04	30·92	21·0	19·66
Total acidity, °°/° (grammes per litre, as sulphuric	2·35	3·67	3·35	4·4
Volatile acid °°/° (grammes per litre, as sulphuric)	0·77	0·53	0·59	0·62
Total SO_2 (grammes per litre)	0·152	0·064	0·153	0·096

Analyses of Several French Muscats Quoted by P. Gervais in "Ampelographie", Vol. III., p. 383.

	Proof Spirit, per cent.	Sugar, per cent.	Total Acid, grammes per litre.	Volatile Acid, grammes per litre.	Tannin, per cent.
Muscat of Maraussan, very old ..	22·3	16·5	5·3	1·6	0·
" " vintage 1859 ..	22·5	17·8	6·8	1·41	0·
" " " 1870 ..	23·6	11·4	6·1	2·47	0·41
" " " 1882 ..	24·9	11·2	5·5	1·76	0·14
Musat of Frontignan, vintage 1897 ..	19·3	23·7	5·31	1·44	0·09
Muscat of Lunel, vintage 1875 ..	20·6	22·1	7·34	1·84	0·19
" " " 1898 ..	23·0	19·3	4·40	2·61	0·12
" " " 1899 ..	17·5	34·6	5·5	1·6	0·23
Muscat of Montbazin " 1895 ..	25·5	6·4	5·3	2·9	0·03

ANALYSES OF TWO SAMPLES OF MUSCAT OF FRONTIGNAN, COLLECTED BY THE WRITER IN 1908.

(These Wines are perhaps of not quite the same high quality as the foregoing.)

		Vintage, 1896.	Vintage, 1897.
Alcohol	per cent. proof	26·45	25·75
Total sugar (after inversion)	.. per cent.	2·54	2·16
Sugar free extract	.. ..	·36	·18
Sulphates (as K_2SO_4)	grammes per lit.	1·13	1·55
Total SO_2	mgrms. per litre	35·	25·
Free SO_2	,, ,,	3·	3·
Acidity—Total, as tartaric	grammes per litre	3·6	3·4
.. Volatile as acetic	.. ..	0·5	0·4

GRADING UP THE HERD.

By R. T. McKenzie, Dairy Supervisor.

It is apparent that there is a good deal of confusion existing in the minds of most dairymen as to the general principles of breeding. If it were not so, we should see more pure-bred bulls amongst the dairy herds of the State. A large amount of money is lost annually through ignorance or indifference on the part of breeders in using "scrub sires." The principles of breeding, through the work of investigators working on Mendel's laws have been placed on a sound basis, and the observance of mere elementals would accomplish substantial results.

The estimated yield of butter fat per cow in Victoria is about 150 lbs. per year. It is no exaggeration to say that it could be increased to 250 lbs. in the course of a few years by careful selection of dams and the use of pure-bred sires.

It was my privilege recently to visit some countries where the farmer appreciates the value of a pure-bred sire, and where many organizations, known as "Bull Clubs," are in existence for the purpose of providing approved sires, and in such countries "scrub" bulls are nowhere to be found. The advantages of this scheme are manifested in the increased returns to the dairyman as compared with our own State. The average production of butter fat per cow in Denmark is 240 lbs., in Sweden 230 lbs., and Holland the same.

Articles from time to time have appeared in this Journal stressing the importance of this question, and the Department a few years ago in a practical way, by placing pure-bred bulls in some districts for the use of settlers, showed with what importance the matter is regarded. Notwithstanding these efforts little progress has been made; in fact, some men in a position to judge claim that there has been retrogression. The average farmer aspires after no standard. He does not appear to realize that the worthless cow requires the same time, care, and attention as the profitable one, that the milking propensity is just as transmissible through the male as the female line, and in the selection of a herd bull he is easy to please.

A dairyman cannot turn his attention to a more interesting or profitable occupation than the grading up of his herd, and few fields offer more room for improvement. That this can be accomplished by the introduction of an approved pure-bred sire the whole history of breeding demonstrates. It is full of examples of how breeders have selected towards a certain standard until an animal has been evolved far superior to any of the original stock.

The dictum "that like begets like" is one of the accepted principles of breeding and generally, with some important modifications, it is true. If one consistently culls from his herd the inferior cows and uses a sire having the characteristics he desires to perpetuate, a substantial improvement must be effected. Whatever the breed, the first stage of improvement must begin with the male, because the cow has only one calf a year and her influence is limited accordingly, whereas the bull may sire all the calves in the herd if it is not a large one, exercising a powerful influence on every calf. That influence will be seen in successive generations, the good qualities of the bull becoming more firmly established, while the indifferent qualities of the original stock will become recessive.

In choosing a pure-bred bull a knowledge of his pedigree and the milking qualities of his maternal ancestors is essential. It is not sufficient to select a bull because he may be a beautiful specimen of his breed, possessing all qualifications looked for in the show ring. That is judging on appearance and indicates only about one-quarter of his value for dairying purposes. What is required in a bull of the dairy type is a combination of appearance and milking qualities, but above all, the bull intended for use in a grade herd should be selected mainly for his power to transmit to his offspring milking and butter fat propensities. Much of the future can be foretold by a study of the past. A good dam and grand-dam go a long way towards establishing desirable qualities in a bull; as a matter of fact, according to Galton's laws of heredity the influence of any ancestor further back than the third generation is infinitesimal.

No great development can take place in the dairy herd unless accurate and complete records are kept, because they form the only safe data for judging dairy cattle. Milking qualities are largely hereditary, and the progeny are likely to inherit the milking characteristics of the dam. It is therefore of fundamental importance that the dairy farmer should have a true record of the performances of his herd, so that he will be enabled to select the heavy milkers for breeding purposes. The possession of milk records is not only a valuable guide for breeding purposes, but is a good asset for sale purposes. In Denmark the price of a cow is often regulated by her milk records. The owner, through the operation of the Control Societies, is able to furnish an authentic history, not only of the dam, but of several generations, with information of milking qualities likely to be transmitted. Many cattle are sold without the purchaser having previously seen them, the purchase being determined purely through this "pedigree of performance."

In order that the improvement may be made continual from generation to generation only heifers from tested cows should be used, and with a pure-bred bull for siring, development is certain.

The writer visited a herd of cows in the south of Sweden which the

pure-bred bull. A "tested" bull is one that has demonstrated that he can beget offspring superior to the dams. Such a bull has a positive breeding value. "Scrub" bulls have a negative breeding value, for practically in every case the offspring give less milk than the mothers did.

In some cases, perhaps, dairymen are deterred by the high cost from purchasing a pure-bred bull, but probably no more economical investment can be made, as is shown by the following particulars obtained by the writer from Mr. F. Linde, when on a visit to his farm at Odense, Denmark. Mr. Linde purchased a "tested" pure-bred bull for £100, selling three of his cows to provide the purchase money. This bull increased the milking capacity of his daughters by 1,000 lbs. of milk and the butter-fat test .75 per year, as compared with the dam.

The dams over a period of six years averaged 5,672 lbs. of milk, butter-fat test of 3.5 per year. The daughters during a six-years' test averaged 6,680 lbs. of milk with a test of 4.25. The following table will illustrate the position:—

Cows.	Average Yearly Milk Production.	Average Butter Fat Test.	Average Yearly Fat Production.	Increase per Year of Daughters above Dams.	
				Milk.	Butter Fat.
	lbs.		lbs.	lbs.	lbs.
Dams ..	5,672	3·5	198·5	..	..
Daughters ..	6,680	4·25	283·9	1,008	85·4

The total increase for the whole herd of thirty cows for the six years was 181,440 lbs. of milk and 15,372 lbs. of butter fat. If we estimate the value of butter fat at 1s. per lb. the extra yearly income was £128 5s., or a total for six years of £745 10s. The average yearly return of the dams was £9 18s. 6d., for the daughters £14 4s.—a difference in favour of the latter of £4 5s. 6d. Who will say that this pure-bred bull did not shew a handsome profit? The records of the daughters do not show altogether the full value of this bull, for his influence on the subsequent generation must be taken into account; his grand daughters inhérited his milking qualities and added very materially to the productiveness of the herd.

Many similar instances showing the value of a pure-bred bull could be quoted. The sooner dairymen discard the mongrel sires at present in use and replace them with pure-bred animals—and the Government herd-testing records makes a wide choice possible—the sooner results will be obtained that more nearly approximate those of the other great dairying countries of the world.

FLUCTUATIONS IN THE EGG MARKET.

(*By A. V. D. Rintoul, Assistant Poultry Expert, N.D.D.*)

There can be very little doubt that we shall have to accustom ourselves—for some years at any rate—to a fresh range of prices so far as labour, building materials, and foodstuffs are concerned. Five years of

increased demand for—with consequent scarcity of—labour and raw material.

Increased production can therefore best form the solution of whatever difficulties and changes we may have to face, this production being coupled with improved methods of marketing, backed up by a definite and comprehensive scheme of co-operation.

Nothing particular is wrong with the poultry industry, any troubles being entirely attributable to the indiscretions of some of those actually engaged in the business. Poultry-keeping—the chief objective of which is egg-farming—is primarily a rural industry—preferably a side line—to general farming. No one would suggest Toorak for wheat farming, nor St. Kilda as a site for an orange grove—yet because from time to time some misguided person fails to make a success of poultry-keeping on highly-priced building land virtually within the "brick" area, the press is inflicted with complaints about the industry. Decentralization and close co-operation are necessary.

It was stated in a recent American publication that if every farmer would keep 120 birds on his farm the revenue from these birds would be worth 1,250,000,000 dollars a year to the United States. Already the Victorian poultry returns compare favourably with those in America, being about 32s. 6d. annually per head of the population, as against 30s. in the States; and our returns could be more than doubled by the establishment of a poultry plant on every farm, which could be operated in a small way without additional labour, and with the advantage that *on the farm the cost of producing a dozen eggs would be about half the cost involved in the metropolitan suburban area*, where all foodstuffs have to be bought generally at top retail prices.

Lack of proper co-operation is a very serious bar to success, poultry-keepers invariably viewing an organised attempt at co-operation with considerable suspicion.

In view of the fact that the majority of poultry-keepers require regular payments from the sale of their eggs, and to enable them to reap the full advantage of the very high prices likely to prevail this coming autumn and winter for eggs, the Cabinet recently made the sum of £5,000 available as an advance against eggs placed in cool storage, and chamber space was reserved which, perhaps, might have been more profitably set aside for meat. It must for ever remain a remarkable fact that not one egg farmer has taken advantage of one penny of this proffered loan! When the grant was first made eggs were selling at from 11d. to 11½d. per dozen, and the cool storage proposition showed every prospect of a net profit of 8d. or so a dozen, or at least 15s. a case. One selling agency alone had an order for 6,000,000 eggs for an individual speculator who was willing to step in where the poultry farmer (aided by a Government loan) was afraid to tread. Now we read in the press that because wheat has risen, innumerable five-guinea birds are being sold for table purposes!

It would require very little co-operation on the part of the commercial egg farmers to control the market all the year round and insist on a fair price commensurate with the cost of production, instead of leaving the question of price to the dealers, who at present dictate to the industry. The Railways Classification Board has just fixed 11s. 9d. a day as the minimum wage for the lowest grade porter. If the poultry-keeper is to accept this humble sum as his daily wage for seven days' work a week, he will require 1d. per week per bird—on a 1,000-bird

flock basis—to pay his wages, and another ½d. per bird per week for housing and equipment, besides a return for food, before any profits can be derived. A simple calculation may be made to determine the daily egg yield required to pay for the actual food consumed as follows:—

X = cost of 100 lbs. weight of grain and meal.
Y = price received for one dozen eggs.

$\frac{X}{Y} \times 3$ gives the daily yield for 100 birds to pay feed bill.

If, therefore, 100 lbs. of food costs 12s., and eggs are worth 1s. 6d. per dozen,

100 birds must lay $\frac{\text{12s.}}{\text{1s. 6d.}} \times 3$, *i.e.*, 24 eggs daily to meet their feed bill.

On this basis breeders could fix a range of wholesale prices from, say, 1s. 3d. per dozen in the spring, to 2s. in the winter, and all surplus eggs could be exported.

Just at present America presents a very attractive field for the export of eggs, as owing to the rate of exchange so far as money is concerned, 30 per cent. will be added to the selling price.

One is almost weary of repeating the fact that eggs laid in the spring time during the glut period can be exported so as to arrive overseas at the time of scarcity.

When the price of wheat goes up, bakers automatically raise the price of bread, yet, we were recently treated to the spectacle in a neighbouring State of pastrycooks trying to prohibit the export of eggs *in order to keep the price down*. Could anything more ridiculous be conceived?

During the last twelve or thirteen years the prices received by poultry-keepers have increased enormously. In January, 1907, eggs brought only 6½d. per dozen, as against 1s. 7d. in January, 1920, whilst for table poultry 6d. per lb. live weight was looked upon as a very satisfactory price, whereas chickens are now fetching from 1s. to 1s. 2d. per lb. at auction. Thus even if the cost of food-stuffs has doubled the poultry farmers' returns for both eggs and meat have doubled also.

Close co-operation amongst the commercial egg farmers is much more difficult to achieve than it appears. In the first place the great boom in egg-laying competitions in this State is grossly exaggerating the value of mere scores, and the industry is largely controlled by stud-breeders. While the stud-breeder is entitled to his place in the sun, it should never be forgotten that the commercial egg farmer is the mainstay of the industry. Without him the stud-breeder would soon find himself in difficulties; therefore, a fair price for eggs—taking into consideration the cost of production—should be the slogan for all members of the National Utility Poultry Breeders' Association.

A very determined effort should be made to pool and place to the best advantage all the new laid eggs during next August, September, and October. With wheat selling at about 8s. 4d. per bushel delivered (retail price), and other foodstuffs in proportion, it must cost 3d. per week to feed each bird. At least one penny per week must be allowed for labour and equipment, so that eggs should average fully 1s. 8d. per dozen throughout the year if the egg farmer is to receive the return to which he is entitled.

Wholesale Price of Eggs in Melbourne for Past Thirteen Years.

	1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.	1916.	1917.	1918.	1919.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1st January	0 6¼	0 7	0 10	0 10	0 9	0 9	0 10	0 10½	1 0	1 3	1 0½	1 0	0 11
15th ,, ...	0 6	0 7	0 10½	0 9	0 9½	0 8¾	0 10	0 10½	1 0	1 3	1 0½	0 11	0 11
1st February	0 6	0 8½	0 11½	0 11	0 9	0 11	0 11	1 2	1 4	1 6	1 2	1 0	1 1
15th ,, ...	0 9½	0 9	0 11	1 0	0 11½	0 11½	1 0	1 3	1 4	1 8	1 6	1 2	1 3
1st March	0 10	0 10	0 11	0 11	0 10½	1 0	0 11¼	1 3	1 5	1 6	1 4	1 4	1 5
15th ,, ...	0 10½	0 10	1 0	1 1	0 11	0 11½	0 11	1 2	1 8	1 8	1 4	1 4½	1 6
1st April	1 0½	1 2	1 2	1 2	1 1	1 1	1 3½	1 5	1 11	1 10	1 6	1 6	1 6
15th ,, ...	1 2	1 5	1 3	1 2	1 4½	1 4	1 4	1 8	2 0	1 11	1 9	1 7½	1 8
1st May	1 2	1 5	1 8	1 5	1 5½	1 7	1 6	1 8	1 10	2 3	1 10	2 0	2 0
15th ,, ...	1 4	1 6½	1 6	1 6	1 6	1 8	1 7	1 9	1 10	2 0	1 10	1 10	2 0
1st June	1 4	1 8	1 5	1 6	1 6	1 7	1 4½	1 10	2 0	2 0	1 10	1 10	2 0
15th ,, ...	1 3	1 4	1 7	1 3	1 7	1 5½	1 4½	1 6	2 0	1 8	1 6	1 10	1 10
1st July	1 1	1 4	1 2	1 4	1 3	1 6½	1 3	1 3	1 8	1 6	1 3	1 5	1 6
15th ,, ...	0 10	1 4	1 3	1 3	1 1	1 5½	1 1	1 4½	1 8	1 7	1 4	1 3	1 7½
1st August	1 0	1 0	1 0	1 2½	0 11½	1 4½	1 1	1 4½	1 8	1 2	1 1	1 4	1 7
15th ,, ...	0 9	0 11	0 11½	0 10½	0 9¾	1 0	0 10½	0 9½	1 5	1 0	0 11½	1 2	0 11½
1st September	0 8	0 10	0 8	0 9½	0 9½	0 10½	0 10½	0 10½	1 5	1 0	0 9½	0 10	0 11½
15th ,, ...	0 8	0 9	0 9	0 9	0 9	0 11	0 11	0 10	1 2½	0 10	0 9½	0 10	1 0½
1st October	0 8½	0 10½	0 9	0 8	0 8¾	0 11	0 10	0 9½	1 3½	0 10½	0 9½	0 10½	1 2½
15th ,, ...	0 8½	0 10	0 9	0 7½	0 8¾	0 11	0 9½	0 10	1 4	0 10½	0 9	0 9½	1 2½
1st November	0 9½	0 9½	0 9	0 8	0 9	1 0	0 9½	0 10	1 4	0 10½	0 9	0 10½	1 2½
15th ,, ...	0 9¼	0 10½	0 8½	0 8½	0 9½	0 11	0 9½	0 10	1 4	0 11½	0 8½	0 10½	1 3
1st December	0 9	0 10	0 8	0 9	0 10	1 0½	0 10	0 11	1 5½	0 11½	0 10	0 11	1 4½
15th ,, ...	0 9½	1 0	0 10	0 9½	0 9¾	1 0½	0 10½	1 4	1 5½	1 0½	1 0	0 11	1 4½
Range of prices	6d. to 1s. 4d.	7d. to 1s. 8d.	8d. to 1s. 7d.	7½d. to 1s. 6d.	8¾d. to 1s. 7d.	8¾d. to 1s. 8d.	9½d. to 1s. 7d.	9½d. to 1s. 10d.	1s. to 2s.	10½d. to 2s. 3d.	8½d. to 1s. 9d.	9½d. to 2s.	11d. to 2s.

RUTHERGLEN EXPERIMENT FARM.

P. B. O'Keefe, Manager.

Following the heavy downpour of rain in December, 1919, weather conditions in January were very dry, 17 points of rain only having fallen during the month.

The growth among stubbles and summer varieties of grass, however, remained succulent, and assisted materially in maintaining the health and condition of live stock. Stubble land is in good condition for working, therefore good headway has been made with ploughing and the cultivation of fallows in preparation for approaching seeding time.

Grading of seed wheat for sale to farmers is progressing satisfactorily, the sample being very clean and bright. It is possible to increase production by adopting more rational methods, and in this connexion there is nothing more important than the careful selection of the seed. Not only the quality of the seed should be studied, but also its suitability for the conditions prevailing in the district where planted, its suitability for the purpose for which the resultant crop is intended, and the time of sowing. Speaking generally, the experience gained here goes to show that the undermentioned wheats are suitable under varying conditions as follows:—For early and mid-season sowing, for grain, Yandilla King and Federation; for late sowing, early maturing varieties, such as Gluyas and King's Early; for hay or feeding-off, Warden, planted early, or King's Early, late sown. The last-named wheat, however, being bearded and weak in the straw, is not regarded with favour by the average farmer.

The selection of wheat for seed on this farm commences when the plants are in the stud cereal area. The best heads are selected, and the resultant seed from these graded and planted out in successive seasons. Five years are required to produce the bulk supply sold to farmers. Each season just prior to harvest all areas are carefully inspected and any plants showing a variation from the true type, as well as strange wheats accidentally introduced, are picked out by hand. In addition to this, all machinery, harvesters, headers, strippers, grader, &c., are scrupulously cleaned after each variety. The amount of extra labour and expense put into the preparation of this seed wheat makes it impracticable to supply large quantities of seed to individual farmers. Farmers would be well advised each year to set aside a small area of clean fallow and purchase sufficient high-class seed for the area, using the grain produced for their wheat fields the following season. In this way they would be always assured of a good supply of pure seed of heavy producing quality.

Cultural Operations.

One hundred and eighty acres have been ploughed since the begining of the year, in addition to 200 acres of fallow, on which summer crops of rape and millet were sown. The fallows are being actively worked to conserve moisture and to prepare for seeding.

Stock.

Teams are in good healthy condition and practically free from harness galls, and appear quite equal to the task ahead for the next few months.

Dairy Herd.

Two cows have come into profit during the month, both dropping heifer calves. One of these cows, usually a heavy milker, has developed udder trouble, and may have to be fattened off. The second cow—a Shorthorn cross—is doing well, having yielded in sixteen days since coming in 763 lbs. milk, with a 4 per cent. test. The average yield of herd per head for the month was 64 gallons, with a 4.2 test, whilst the value of produce sold was £1 9s. 2d. per cow. Fodder consists of chaff, damped with molasses, with a dust of bran added, green maize, sorghum, and natural pasture. One fat dry cow was sold for £18. Young stock are in excellent condition. Grown steers have put on a lot of flesh, and will be marketable at an early date.

Sheep.

Breeding ewes are all in good thrifty condition. Weaners are doing remarkably well, about 75 per cent. being in prime condition. All four and two tooths Border Leicester ewes have been mated with ram "Kelso Douglas," imported from New Zealand.

EXPERIMENTAL PLOTS, STATE RESEARCH FARM, WERRIBEE.

G. S. Gordon, Field Officer, State Research Farm, Werribee.

General.

Abnormally cool, and even cold weather, was experienced during January. The highest air temperature recorded was 94 degrees F., and the lowest 44 degrees F. The rainfall amounted to 125 points, 93 of which fell in the last week.

Another cultivation of the fallow sections will be undertaken in an endeavour to combine as much of this moisture as possible with that already conserved in the soil for the use of the next crops. The cool season has somewhat retarded the growth of lucerne, but has helped summer crops of rape, while the rain has benefited both and enabled ploughing to be done under better conditions.

Meteorological Observations.

On page 120 will be found a summary of the meteorological observations recorded during 1919, together with previous average records. A few of the outstanding features contained in the summary may be particularized as follows:—

1. *Rainfall.*—The figures for the years prior to 1913 have been taken from the only record kept up to that time in the district, and they show that for a period of 42 years the average annual rainfall amounted to 20.19 inches. The first six years' record taken at the farm gives an average of 19.01 inches, or more than 1 inch less. In 1919 the rainfall amounted to 20.69 inches, being greater than either of the above averages; but notwithstanding this, the year was regarded as a comparatively dry one in the district, and the crops were much below the average. This is accounted for by the fact that nearly 14 inches of the rain fell outside the growing period of cereal crops, and only 6.97 inches from 1st May to 31st October. These figures, in conjunction with harvest yields, not only point to the benefit of a good distribution of the rain, but to the possibilities of moisture conservation by fallowing.

Had the total amount been better distributed there would have been ample for the requirements of heavy crops.

2. *Bright Sunlight.*—This is somewhat lower than usual, but it is interesting to note that at Werribee—in "Sunny Australia"—the bright sunlight averages slightly under five hours per day for every day of the year.

3. *Evaporation.*—This, too, is lower than the average for the previous five years, although it indicates that in twelve months almost 4 feet of water would be removed by evaporation from all dams and exposed water surfaces in the district.

4. *Air and Soil Temperatures.*—These are of interest and value in comparing the results from various experiments from year to year, and have a direct bearing on the growth of all plants.

Barley Variety Tests, 1919.

The harvest yields from these plots are recorded in Table No. I., and although they are comparatively low, they are quite as good as might have been expected under the seasonal conditions. The two-rowed malting barley Pryor, in particular, has done well under the dry conditions, with a yield of 21 bushels 6 lbs. per acre. This variety has given consistently good yields, and besides being fairly early, its fine pliable straw enables it to withstand wind and rain better than most barleys of its type. No. 36 has also given a better yield than the check plots of Cape barley. It is a six-rowed barley of the Cape type.

TABLE No. I.

BARLEY VARIETY TESTS 1919.

Sown on well-worked fallow in Field No. 14, S.E., on 14th to 18th June, 1919; 70 lbs. graded seed, pickled with $1\frac{1}{2}$ per cent. solution of bluestone, sown with 120 lbs. super. per acre. Harvested 17th-18th December, 1919.

Rainfall during growth, 5 inches; plot area, $\frac{1}{8}$ acre.

Plot No.	Variety.	Plot Yield.	Yield per Acre.		Remarks.
		lbs	Bushls.	lbs.	
1	Cape	95	15	10	Some grain lost through bad stripping
2	W4011D, Roseworthy Oregon Californian Feed	97	15	26	
3	Roseworthy Oregon	75	12	0	
4	Chilian C	75	12	0	
5	Chilian D	74	11	42	
6	Barley No. 36	118	18	44	
7	Barley No. 49	79	12	32	
8	Primus	64	10	12	
9	Pryor	132	21	6	
10	Cape	105	16	40	
11	Crossbred 1 $\frac{b6}{2}$	$83\frac{1}{2}$	13	18	

Meteorological Observations at Werribee.

Summary of observations made during 1919, and comparison with averages for previous years:—

Rainfall.

Average annual rainfall for forty-two years prior to 1913 ..	20·19 inches
Average annual rainfall for period 1913 to 1918 (6 years) ..	19·01 ,,
Rainfall during 1919 (536 points in March and 358 points in December)	20·69 ,,

Bright Sunlight.

Average annual total during five-year period, 1914 to 1918	= 1,848·4 hours	= Daily Mean, 5·0 hours.
Total during 1919 ..	= 1,673·9 ,,	,, 4·6 ,,

Evaporation.

Average annual total from free water surface during five-year period, 1914-1918	47·079 inches
Total during 1919	46·120 ,,

Mean Air Temperatures.

Period.	Dry Bulb.	Wet Bulb.	Maximum.	Minimum.	Mean of Max. and Min.
Average for 5 years, 1914 to 1918	58·3° F.	54·0° F.	67·2° F.	48·1° F.	57·6° F.
During 1919 ..	59·2° F.	53·7° F.	67·7° F.	49·6° F.	58·6° F.

Mean Soil Temperatures.

Period.	At 1 Inch.		At 6 Inches.		At 12 Inches.		At 24 Inches.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
Av'ge for 5 years, 1914 to 1918	70·0° F.	51·4° F.	62·3° F.	53·8° F.	60·°2 F.	55·6° F.	59·2° F.	57·1° F.
During 1919	69·6° F.	53·6° F.	62·5° F.	55·3° F.	60·2° F.	55·5° F.	59·3° F.	56·9° F.

Mean of Maximum and Minimum Soil Temperatures.

Period.	At 1 Inch.	At 6 Inches.	At 12 Inches.	At 24 Inches.
Average for 5 years, 1914 to 1918	60·8° F.	58·0° F.	57·9° F.	58·1° F.
During 1919	61·6° F.	58·9° F.	57·8° F.	58·1° F.

from which it will be seen that the well-known variety, Algerian, has held its own very well. The only variety to beat the average yield of the two check plots was Mortgage Lifter. This variety—which is very like Algerian in appearance—was included in the tests for the first time.

TABLE No. II.

OAT VARIETY TESTS.

Sown on well-worked fallow in Field No. 2, N.E. Seed, 61 lbs. per acre; sown on 27th May, 1919, with 120 lbs. super. per acre. Plot area, $\frac{1}{16}$ acre. Crop harvested 9th December, 1919.

Rainfall during growing period, 6 inches.

Plot No.	Variety.	Plot Yield.	Yield per Acre.		Remarks.
		lbs.	Bushls.	lbs.	
1	Algerian ..	38	15	8	Slightly damaged by rain-storm
2	Mortgage Lifter	43	17	8	Not quite so badly damaged as Algerian
3	Argentine ..	36	14	16	Badly laid by rain-storm
4	Guyra ..	31	12	16	Practically all tangled and laying on ground by rain-storm
5	Lachlan ..	39	15	24	Also damaged, but not so badly as Guyra
6	Sunrise ..	26	10	16	Slightly damaged, but not quite so much as Algerian
7	Glen Innes ..	22½	9	0	Very badly damaged by storm
8	Algerian ..	44	17	24	Slightly damaged by rain-storm

Permanent Manurial Field, 1919.

The yields from the plots in this field are recorded in Table No. III. They again point to the advantages to be obtained from the rational use of fertilizers, the outstanding feature being the benefit derived from the use of fertilizers containing water soluble phosphate. The plots fertilized with superphosphate show a gradually ascending yield from the various applications right up to the heaviest dressing of 2 cwt. per acre. The results from the superphosphate-dressed plots for 1919, and the average for these plots during the past five years (1915 to 1919 inclusive) may be summarized thus:—

YIELDS FROM PLOTS TREATED WITH SUPERPHOSPHATE.

Plot No.	Treatment per Acre.	Yield per Acre in 1919.		Average Yield per Acre for Five Years 1915–19.	
		Bushels	lbs.	Bushels	lbs.
4	No manure	2	0	7	12
5	½ cwt. of superphosphate	7	36	12	13
10	1 cwt. of superphosphate	14	48	14	14
6	1½ cwt. of superphosphate	17	40	14	33
7	2 cwt. of superphosphate	18	16	14	30

The increase from 2 bushels per acre on the unmanured plot to 18 bushels 16 lbs.—over nine times as much wheat—on the plot which received 2 cwt. of super. per acre, is remarkable; but the average yield for five years, though not showing such a wide range, may be considered a more reliable guide. Here the yield ranged from 7 bushels 12 lb. on the unmanured plot to 14 bushels 33 lb. on that which received

1½ cwt. of super. The return from the plot given ½ cwt. of super. was 5 bushels 1 lb. more than that from the unmanured plot; 1 cwt. increased the amount to 7 bushels 2 lbs., and 1½ cwt. gave the still greater increase of 7 bushels 21 lbs. per acre. Taking the value of the increased yield due to the fertilizer at 4s. per bushel, the following figures are arrived at:—

½ cwt. super. costing 2s. 6d. produced extra wheat worth 20s. or 17s. 6d. net profit per acre.

1 cwt. super. costing 5s. produced extra wheat worth 28s. or 23s. net profit per acre.

1½ cwt. super. costing 7s. 6d. produced extra wheat worth 29s. 4d. or 21s. 10d. net profit per acre.

Thus the 1 cwt. dressing gave the greatest net profit per acre, but taking into consideration the proved benefit of the residual effect on the pastures following the crop, the heavier dressings—up to at least 1½ cwt.—would seem to be the more profitable at Werribee.

Table No. III.

Permanent Manurial Field.

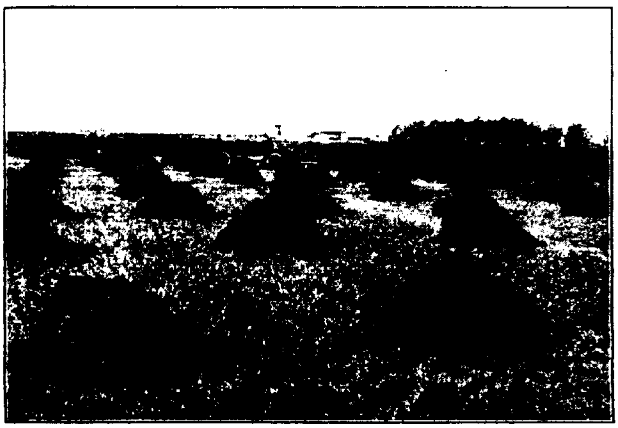
Harvest Results—Season 1919.

Crop, Yandilla King wheat; 68 lbs. graded seed, sown 30th and 31st May. Harvested 3rd January, 1920.

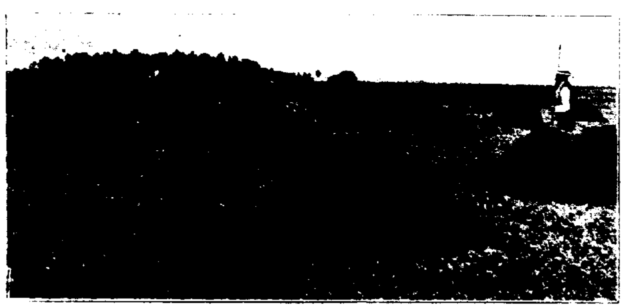
Plot No.	Treatment per Acre.	Plot Yield.	Yield per Acre.		Remarks.
		lbs.	Bushls.	lbs.	
1	Superphosphate, 1 cwt.	160	10	40	Sown on well-worked fallow; one crop in two years
2	Farmyard manure, 10 tons ..	168	11	12	
3	Farmyard manure, 10 tons + lime, 10 cwt.	189	12	36	
4	No manure	30	2	0	
5	Superphosphate, ½ cwt.	114	7	36	
6	Superphosphate, 1½ cwt.	265	17	40	
7	Superphosphate, 2 cwt.	274	18	16	
8	Superphosphate, 1 cwt. + nitrate of soda, ½ cwt., at seeding time	188	12	32	
9	Superphosphate, 1 cwt. + nitrate of soda, ½ cwt., top-dressed in spring	242	16	8	
10	Superphosphate, 1 cwt.	222	14	48	
11	Superphosphate, 1 cwt. + sulphate of potash, ½ cwt.	207	13	48	
12	Superphosphate, 1 cwt. + nitrate of soda, ½ cwt., and sulphate of potash, ½ cwt.	159	10	36	
13	Bone fertilizer, 1 cwt.	74	4	56	
14	Thomas' phosphate, 1 cwt. ..	98	6	32	
15	Superphosphate, ½ cwt. + Thomas' phosphate, ½ cwt.	162	10	48	
16	Superphosphate, 1 cwt. + lime, 5 cwt.	176	11	44	
17	Superphosphate, 1 cwt. + lime, 10 cwt.	195	13	0	
18	Superphosphate, 1 cwt. + lime, 20 cwt.	227	15	8	
19	Superphosphate, 1 cwt.	179	11	56	
20	No manure (continuously cropped)	48	3	12	Sown on stubble land every year
21	Superphosphate, 1 cwt. (continuously cropped)	138	9	12	

THE PERMANENCE OF LUCERNE.

Investigations regarding the essential factors governing the successful cultivation of lucerne under irrigation have been one of the most satisfactory and encouraging of the many series of experiments carried out at the State Research Farm. The results from some of these have been published in this *Journal* from time to time, and the knowledge has been put into practice in cultivating the bulk areas on the farm,



1.—This stand of lucerne is now seven years old. In its second season (1914) it gave 6½ tons of hay per acre, besides winter grazing. This illustration, taken on the 9th January last, shows the third cut for the present season.



2. A view taken from about the same spot as was the illustration above. This picture was taken during the second season (1913-14).

and the crop has proved so valuable that the lucerne areas have been gradually increased until they now amount to over 200 acres. Under favorable conditions lucerne is known to continue profitable for many years, and some of that growing on the Research Farm is now seven years old.

The following brief account and accompanying photographs will serve to indicate the permanence and usefulness of the crop. The first paddock sown contained an area of 50 acres, on 15 of which the lucerne

is now seven years old, and on the balance six years. The treatment of and results from the yield have been carefully recorded during these periods, and the history of the oldest portion may be summarized as follows:—

The soil is a reddish clay loam, resting on a stiff clay subsoil, and through prior continuous cultivation (chiefly for oaten hay) it is deficient in humus and phosphates.

3.—Returned Soldier Trainees cocking Lucerne at State Research Farm, Werribee. This field was sown in 1912.

4.—Lucerne six years old. Third crop for 1919-20 season, showing twenty days' growth.

From this on it has consistently given heavy yields, ranging from four to six cuttings per year, varying with the season and water supply, and has also provided grazing each winter equivalent to about two sheep per acre *for the whole year.*

In its second season—1913-14—it produced six cuttings, totalling 6½ tons of hay per acre. One of these is depicted in Illustration No. II. During the present season three heavy cuttings have been harvested to date from the same area, and the fourth is now growing vigorously. The crop from the third cutting this season is shown in Illustration No. I., and comparing this crop together with the thick, healthy, clean lucerne now growing, with the crop shown in Illustration No. II., which was taken in the second season, and from about the same location as No. I., it is quite evident that the stand is not only quite as good to-day as it was in 1914, but that there is every indication it will continue to give profitable yields for some years to come.

The main items which have materially helped to obtain the fine stand and maintain its productivity are :—

A. Preliminary work.

(1) Subsoiling and careful grading to permit of an even distribution of the irrigation water and yet prevent water logging.
(2) Careful preparation of the soil in order to insure good germination and a clean seed bed.
(3) The application of 1 ton of lime per acre.
(4) Sowing the seed (Tamworth, which is very similar to Hunter River lucerne) at the rate of 16 lbs. per acre, 8 lbs. being mixed with 1 cwt. of super. per acre immediately before sowing, and drilled very shallow each way. This insures an even distribution of the seed and a good stand if the other conditions are right.

B. Maintenance of the Stand.

(1) Thorough renovation of the field by cultivating it at the end of each winter grazing period—about August—in two directions at right angles to each other, with a narrow diamond-pointed rigid-tyned cultivator. This breaks up the hard surface crust caused by irrigation, aerates the soil and keeps the stand free from weeds.
(2) Top-dressing with 2 cwt. superphosphate per acre after the above cultivation, so as to supply some of the mineral plant food which such heavy crops necessarily remove from the soil.
(3) Harrowing and rolling after drilling in the super. to further break and "set" any clods, and thus prevent them being raked up with the first "cut" for the season.
(4) Careful irrigation, cutting, and grazing.

At first sight the cost of preparing, grading, and seeding land to lucerne is generally considered high, but a crop which gives such remarkable results over a long period is worthy of every possible attention

field should last, the cultivation, &c., works out at a comparatively low annual amount per acre.

Lucerne may be said to be the mainstay of irrigated agriculture in its early stages, and an important factor in promoting the prosperity of any district in which it can be extensively grown. When most other crops and pastures are parched and dry in summer, it is pleasing to see the extensive fields of green succulent lucerne providing immediate feed for stock as well as giving promise of a fine "cut" of hay for the winter months. The heavy "cuts" now being obtained at the Research Farm seven years after seeding should remove any possible doubt regarding the permanence of the crop in the Werribee district, and tend to confirm the opinions often expressed by enthusiastic lucerne growers to the effect that it is the "king of fodders" and the greatest mortgage lifter and soil renovator known amongst farm crops.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

YOUNG TREES.

Young trees of the Citrus family should now be making a good, thrifty growth. The foliage should be glossy, and its general appearance a bright green and healthy one. Occasional light waterings, as well as mulching of grass, or of well-rotted manure, will be helpful to the trees.

Young deciduous fruit trees will also benefit by having a grass or manure mulch; and, if it has not previously been attended to, unnecessary growths in the centre of the tree and on the main leaders should be removed.

FUMIGATION.

Evergreen trees, including those of the citrus family, that are infested with scale, should now be sprayed or fumigated to rid the trees of this pest. For spraying, a weak red oil emulsion, lime and sulphur spray, or resin wash will be found useful. The most successful method, however, of dealing with the scale pest is by fumigation. The trees should be closely enveloped in an airtight sheet or tent, and hydrocyanic gas generated inside. The chemicals for generating the gas, as well as the fumes of the gas itself, are excessively dangerous, and great care is necessary in their manipulation. A wooden, enamel, or earthenware vessel is placed inside the tent, the vessel containing a mixture of 4 fluid ounces of sulphuric acid, and 12 fluid ounces of water, the acid being placed in the vessel first. Four ounces of cyanide of potassium is then quickly dropped into the vessel, the tent closed down at once, and the bottom of the tent all round covered with soil to prevent any of the gas escaping. The operator must take care that not the slightest portion of the fumes is breathed. Fumigation should be carried out at night-time or on a cloudy day, if the foliage of the trees be thoroughly dry.

The Vegetable Garden.

Celery crops will now be a prominent feature in the vegetable section. The seed may be sown from January to March, and succession plantings should be carried out occasionally during those months. The growth of celery should be quick; a fair supply of water and a good rich, loose soil are helpful to its growth.

Ample water will now be required in the vegetable garden. The surface should be kept well hoed, and mulchings of manure given wherever possible.

Cabbage, carrot, turnip, radish, lettuce, peas, cauliflower, &c., seeds may now all be sown, and young plants from any seed beds planted out.

The Flower Garden.

Constant watering and hoeing will now be required for successful gardening. Cannas will require manuring; the old flowering stem should be removed to make way for the new growths. Dahlias and chrysanthemums will need a great deal of attention, staking the growths as they develop, disbudding, thinning out weak shoots, and removing unnecessary growths. The dahlias should receive a good soaking of water during the hot weather, and liquid manure or quick acting fertilizers given when the flower buds are developing. When chrysanthemum buds are very small, liquid manure should be applied. Roses may now be summer pruned; all weak growths should be removed, and the strong ones shortened to a fairly good bud. The plants should then receive occasional waterings with liquid manure, and be kept well supplied with water.

All flowering trees and shrubs that have finished blooming should be pruned, the flowering growths removed, and, unless the seed is required, all seed heads cut off.

Cuttings of pelargoniums, zonale and regal, may now be planted, and delphinium spikes that have finished flowering cut down to make way for new growth, the plant being watered and manured. Seeds of perennial and hardy annual plants, especially winter-flowering sweet peas, Iceland poppies, stocks, and pansies, may now be sown, and a few bulbs for early flowering planted. The beds should be well manured and deeply worked in anticipation of planting the main crop of bulbs.

REMINDERS FOR MARCH.

LIVE STOCK.

HORSES.—Feed as advised last month. Those in poor condition should be "fed up" in anticipation of winter.

Should horses not be feeding well and salivating, examine mouth for grass seeds. Horses running at grass are frequently affected by them. The seeds should be removed, and a mild mouth wash used. A very weak solution of Condy's Fluid will answer the purpose.

Grass seeds also cause blindness if not removed from the eye, and the inflammation reduced by bathing the eye with boracic solution. A teaspoonful of boracic acid to a pint of boiling water is the correct strength for the purpose. Should a scum remain over the eye inject into the eye every other day a small quantity of the following solution:—Sulphate of zinc, 4 grains; water, 1 pint.

centrates mixed in at time of feeding. This soaking will soften the grain in the chaff, preventing its loss in the dropping, and is the nearest substitute for the succulence so necessary. Algerian oats should be sown on suitable land for grazing off in the winter. Sow a mixture of oats, rye, and tares or peas for winter fodder or to fill silos. Only exceptional cows and those required for town milk supply should be served between now and July. Within the next two or three months is the best time for cows to calve, as they will pay to feed through the winter and give the best returns for the season, and be dried off when the grass is dry and scarce. Calves should be given lucerne hay or crushed oats where grass is not available.

PIGS.—Sows about to farrow should be provided with short bedding in well-ventilated sties. See that the pigs have shade, and water to wallow in. Pigs should be highly profitable now.

SHEEP.—All ewes should be kept strong for lambing. Crutch round tails and lessen accumulation of discharge, and consequent attraction to the fly pest at lambing time. Clear wool from round udders and teats and thereby save many a lamb in bad weather; especially is this necessary in the case of young ewes of the Merino and Lincoln crosses. Clear wool from eyes also. In crutching ewes when close to lambing lay them over carefully, grasp by the thigh low down, not by the flank as is generally done. Pure British breeds of ewes and very coarse cross-breds may still be only coming in season; rams should be left mated to make sure. Clean excessive wool and stains from ewes, and burr and stains from rams to ensure service. Reserve good paddocks, if autumn be favorable, for ewes with early-born lambs. Where possible, castrate the ram lambs immediately. Good prices will be available for this class again this winter.

POULTRY.—Cull out the drones and get rid of surplus cockerels. Keep forward pullets well fed—eggs are rising in value. Repairs to houses should be done this month. Thoroughly cleanse all houses and pens. Spray ground and houses with a 5 per cent. solution of crude carbolic acid. This will act as a safeguard against chicken pox; burn all refuse and old feathers. Provide a liberal supply of green food. For each moulting hen, add a teapsoonful of linseed to the morning mash. Use tonic in mash, which should be kept in cool shady spot.

CULTIVATION.

FARM.—Work fallow where possible for autumn sowing of cereals. Sow winter fodder crops, such as rye, barley, and vetches. Prepare land for lucerne plots for autumn seeding. Make silage of maize and other crops for winter use.

ORCHARD.—Prepare new land for planting; plough deeply and subsoil; leave surface rough. Plant out strawberries after first rain. Plant crops for green manure. Continue to fight the Codlin Moth.

VEGETABLE GARDEN.—Prepare ground for winter crops. Plant out seedlings in moist soil. Sow cabbage, cauliflower, lettuce, early peas, swede turnip, beet, carrot, radish, and early onions.

FLOWER GARDEN.—Cultivate and water. Feed dahlias, chrysanthemums, and roses. Plant out shrubs, trees, and all kinds of bulbs. Sow hardy annuals. Plant geranium and pelargonium cuttings. Spray for Aphis, Red Spider, and Mildew.

VINEYARD.—Select scions, if not done last month. In cooler districts, where ripening is difficult, it may be assisted by removing basal leaves only, as soon as berries change colour. This is the month for drying currants, sultanas, and gordos (Lexias and Clusters). Do not pick before grapes are properly ripe. For instructions for packing grapes for export, apply to Department. Shipments should be made in March and early April.

Cellars.—Vintage month. For light dry wines, pick as soon as grapes are ripe; do not wait for over-maturity, as is so often done. Pay attention to acidity; correct same if necessary with tartaric acid or late grapes. Acidimeter supplied by Department; price 6s. 6d. Sulphiting and the use of pure yeasts are strongly recommended, as they insure production of sound wine; further information supplied on application.

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GOROKE CROP AND FALLOW COMPETITIONS, 1919.

Report of the Judge, H. A. Mullett, B. Ag. Sc., Chief Field Officer, Department of Agriculture.

There is probably no district in the State where there has been less advancement in the methods of wheat production than in the Western Wimmera, of which Goroke is an important centre. Though the rainfall, averaging 20 inches annually, is adequate, the farming methods which have been developed in other districts are not applicable to Goroke without some modification. This is because the majority of the land is of a light character, which is readily set down by heavy winter rains after cultivation, and which then bakes hard in the sun. The remaining land, consisting of heavy "crab-holey" flats and rich sand hummocks near the lakes, does not present the same problems.

The raising of merino sheep on the natural pastures remains the staple industry, but some of the light soils, as well as large areas of the heavy land, are sown to wheat from time to time. On the light land it is found that fair crops of wheat can be grown with a minimum of cultivation; indeed, this method for light land is widely advocated in the district as the best way of raising a crop.

In a general way, however, wheat-growing has up to the present been a secondary consideration to the production of wool, and whenever the interests of the sheep and the wheat crop have clashed it is the latter that has generally suffered.

Under these conditions it would be indeed remarkable if wheat-growing practice had reached as high a standard at Goroke as in districts where wheat-growing is the main industry. It is this, together with the fact that the climatic and soil conditions differ materially from the rest of the wheat belt, that has induced the local agricultural society to conduct these annual Crop and Fallow Competitions, which have for their main object the promotion of investigations into local agricultural problems—especially wheat-growing and the quick spread of the

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best farming practices when discovered—rather than the desire to promote mere rivalry for prizes.

The competitions have now been held for the third time, and already considerable information has been gleaned by a study on the spot of wheat crops and the methods by which they have been grown. In this way the most important local agricultural problems have now been resolved into a sufficiently concrete form to enable their definite investigation to be undertaken by means of local experimental plots.

These plots will shortly be initiated, and the following problems, which have been shown to be most important locally on the light land, will be investigated:—

1. Methods of cultivation.
2. Time of sowing wheat.
3. Manurial tests.
4. Improvement of temporary and permanent pastures.

Good type of bungalow of lime cement, recently erected by Mr. F. O. Robertson, of "Pleasant Banks," Goroke.

The Season.

The present season at Goroke has been very favorable for wheat-growing, because the winter precipitation, which is normally too heavy for the light soils, was much lighter than usual. The official rainfall record for the season shows that 19.15 inches were recorded, of which 6 inches fell outside the growing period of wheat. The rain which fell from April to November, inclusive, was, therefore 13 inches, *i.e.*, almost exactly the average rainfall for Horsham or Nhill over a similar period. Normally 16 inches fall in the wheat-growing period at Goroke.

Most of the crops were somewhat poorly stooled, but were, on the whole, remarkably well headed. Some exceedingly heavy crops of oats were seen on the clay land. Where precaution had not been taken to work the fallows after the heavy summer rains, weeds, particularly the rough sow thistle and the spear thistle, were noticeable in the crops, which, however, were generally free from wild oats.

Results.

SECTION I.—BEST 50 ACRES OF CROP ON HEAVY SOIL.

Name.	Variety.	Yield.	Trueness to Type.	Disease.	Weeds.	Evenness.	Total.
Possible Points ..	.. .. ..	**35**	**20**	**15**	**15**	**15**	**100**
J. Delaney	Federation ..	30	15	13	12	11	81
S. Cross	Yandilla King ..	26	15	13	13	13	80
J. C. McPhee ..	Federation ..	29	11	8	14	13	75
A. Richards	Federation ..	21	16	13	12	12	74
J. E. Molloy.. ..	Federation ..	24	16	8	11	9	68
A. & J. Cumming ..	Federation ..	21	15	12	12	9	67
A. J. Lees	Penny ..	15	17	12	13	8	65

Mr. Delaney's Winning Crop of Federation Wheat on Heavy Soil. Sown on well-worked fallow, 1st May, 60 lbs. seed, 100 lbs. super.

Mr. Delaney's crop of Federation was grown on heavy crab-holey ground, which received in all five cultural operations before sowing. The land was ploughed early with a mouldboard plough and spring-toothed; it was disc-cultivated in the spring to kill weeds and conserve moisture; after harvest it was springtoothed in February after rain, and again just before sowing. The crop was put in with the combined spring-tooth cultivator drill during the first week in May; 60 lbs. of seed were used and 100 lbs. superphosphate, and it was fed off to sheep. It was thick and very nicely headed, though it was patchy in the crab-holes. There was a fair number of strangers present, as was the case with most of the crops seen. The cultivation that this paddock received, particularly the working after the summer rain, and the relatively early sowing, were the main factors responsible for the heavy yield.

Mr. Cross's crop was sown on a rich black flat, which has been well levelled by cultivation. The crop was very tall and regular, though somewhat thin and late. Mr. Cross stated that it was sown with 90 lbs. of a new brand of phosphatic manure, but that where superphosphate was used the crop was markedly heavier. This was the case on a number of farms in the district when the manure was tested alongside superphosphate under equivalent conditions.

Mr. J. C. McPhee's crop of Federation was mainly grown on a fertile loamy bank of a lake. It was very clean and well headed. St'nking smut was, however, present, as was the case with the crop shown by Mr. Molloy. Mr. Lee's crop was sown on stubble land.

SECTIN II.—BEST 50 ACRES OF CROP ON LIGHT SOIL.

Name.	Variety.	Yield.	Tr eness to Type.	Disease.	Weeds.	Evenness.	Total.
Possible Points ..	.. .. ..	**35**	**20**	**15**	**15**	**15**	**100**
Caldow Bros. ..	Federation .. College Purple Straw	22	18	14	14	12	80
C. D. Block	Federation ..	19	19	10	14	13	75
F. O. Robertson ..	Federation ..	23	15	12	13	11	74
A. J. Hawkins ..	Major .. Federation Penny	16	17	12	15	12	72

Heavy bank of College Purple Straw Wheat in Messrs. Caldow Brothers' Winning Crop—Light Section. Fallow left rough, crop sown April, 60 lbs. seed, 100 lbs. super.

Messrs. Caldow Brothers' crop was grown on fallow, which was merely ploughed at the end of August and left in the rough until scarified in the following April. The sowing took place at the end of April with 60 lbs. of seed and 100 lbs. of superphosphate. The paddock was harrowed after the drill, and was fed off with sheep.

The whole of the ground upon which this crop was grown was a shade heavier than the average light land, and the heaviest crop was grown on a rich loamy bank. The crop was very free from strangers and wild oats, and was in every way commendable.

Mr. Block's land was ploughed in August, spring-toothed at the end of September, and harrowed and left until it was re-worked with the spring-tooth the following May, when the sowing took place, 60 lbs. of seed and 112 lbs. of superphosphate being used. This crop was the purest of any seen in the district.

Mr. Robertson's crop was well headed, though somewhat on the thin side. It was probably the heaviest of all the crops shown on light soil. It had received the maximum of cultivation, and was grown on what practically constituted a summer fallow. The land was disc-ploughed in March; subsequently it was springtoothed and then disc-cultivated in the spring. After harvest it was springtoothed after the February rain. The paddock was sown towards the end of April with 60 lbs. of wheat and 100 lbs. of superphosphate, the combined springtooth cultivator-drill being used. The paddock was harrowed after drilling, and fed off to sheep. The crop probably would have benefited considerably by harrowing after the grazing had that been practicable.

SECTION III.—BEST 50 ACRES OF CROP GROWN ON 1918 FALLOW.

(Points for crop and fallow added together.)

Heavy Soil.

Name.	Variety.	Yield.	Trueness to Type.	Disease.	Weeds.	Evenness.	Total 1919 Crop.	Total for 1918 Fallow.	Grand Total.
Possible Points	.. .. ..	**35**	**20**	**15**	**15**	**15**	**100**	**100**	**200**
S. Cross	Yandilla King ..	26	15	13	13	13	80	77	157
J. Delaney	Federation ..	30	15	13	12	11	81	75	156
H. G. Burns.. ..	Federation ..	18	14	12	10	10	64	83	147
J. Cumming.. ..	Federation ..	23	15	10	10	10	68	65	133
J. Molloy	Federation ..	15	13	8	8	5	46	74	110

The exhibits of Messrs. Delaney and Cross were the same as those described under Section I. Mr. Burns' crop was on September-ploughed fallow, which was springtoothed in October. After harvest it was harrowed in March, and was subsequently springtoothed just before seeding in the last week in May. 56 lbs. of wheat was used and 72 lbs. of superphosphate.

The crop was somewhat patchy owing to crab-holes, and had blighted off badly on the limey banks. An interesting illustration of the value of "super" on this class of land was afforded in this paddock where the drill had failed to apply the manure. There was about four bags to the acre difference in the yields of the manured and unmanured portion.

SECTION IV.—BEST 50 ACRES OF CROP GROWN ON 1918 FALLOW—LIGHT SOIL.

(Points for crop and fallow added together.)

Light Soil.

Name.	Variety.	Yield.	Purity and Trueness to Type.	Disease.	Weeds.	Evenness.	Total.	Total for 1918 Fallow.	Grand Total.
Possible Points	.. .. ..	**35**	**20**	**15**	**15**	**15**	**100**	**100**	**200**
Jas. Lowe	Federation ..	22	15	12	13	12	74	77	151
F. O. Robertson ..	Federation ..	22	15	13	13	11	74	73	147
C. D. Block	Federation ..	19	19	10	14	13	75	61	136
Caldow Bros. ..	College Purple Straw ..	23	18	14	14	11	80	44	124

The crops shown by Messrs. Caldow Bros. and Mr. Block were the same as those exhibited under Section II. The fallow on which the winning crop was grown was ploughed in September, springtoothed in November, and disced the following April, prior to the seeding which took place in mid-April. One and a quarter bushels of seed were sown with 112 lbs. superphosphate. The crop was fed off to sheep.

Mr. Robertson's crop received similar treatment to that given to his crop entered in Section II., except that it was sown a couple of weeks later and the seed had not been pickled.

Crops on the Heavy Soils.

At Goroke there are large though patchy areas of rich black soils. Where carefully farmed they are capable of growing heavy crops of wheat. Most paddocks are studded with large crab-holes, which render their management difficult, and result each year in serious loss of wheat owing too water logging.

Type of Land Grader used by Mr. Lees, of Maryvale Station, for levelling "crab-holey" country. Each side of the triangle measures 15 feet.

Cultivating implements assist in dragging portion of the fertile banks into the holes, but where the minimum of working is giving as at Goroke, it is a slow process.

In my earlier reports I have advocated the systematic use of the home-made grader for the purpose. It could be cheaply and effectively employed once or twice each season in place of the usual harrowing. Mr. A. J. Lees has constructed an implement of this type which is doing most satisfactory work. It consists of three heavy pieces of timber each 15 feet long, and bolted in the shape of a triangle. Along each beam heavy iron spikes have been driven at intervals of 6 inches. These project a similar distance into the soil. The implement really acts as a set of very heavy rigid harrows, and when six horses are attached to one corner, a drayload or so of earth can be pulled into each crab-hole passed over. It is economical to work, covering a 15-foot span, but is somewhat cumbersome to transport.

These soils when knocked into shape will pay for the most thorough cultivation, the object of which is threefold. A seed bed with a firm

bottom is required for wheat, the land must be freed of weeds by encouraging the germination of the weeds so that they may be killed by grazing and cultivation before they have seeded, and moisture must be conserved by the formation of a blanket of 2½ to 3 inches of fine mellow loose surface soil. On these soils the best Wimmera practice should be applicable when the weeds, such as spear thistles, &c., will permit it.

The Goroke country is eminently suited for the growing of oats. Portion of a very heavy crop of Algerian oats grown by Mr. Lees, of Maryvale Station, on fallow which was left in the rough till seed time.

Another view of Mr. Lees' heavy crop of Algerian oats.

The ploughing should be done as early as possible with a mouldboard plough from 4 to 4½ inches deep. The land should then be harrowed with heavy harrows. The object is to get a reasonably fine seed bed which will germinate as much of the weeds as possible in the spring, when they can be grazed to sheep, and subsequently the paddock may be recultivated, preferably with a tine scarifier, but with a disc or broad

foot cultivating scarifier if the weeds are too bad. This cultivation should not be deeper than 3 inches and never to the depth of the original ploughing. One objection to using heavy implements like the one-way disc and the cultivating plough for this work is that it is often difficult to keep them at a uniform depth.

Harrowing or springtoothing should then take place with the object of producing a fine mellow surface soil. This having been accomplished, cultivation with the harrows or springtooth should be carried on throughout the summer and autumn each time half-inch or so of rain falls. Just prior to seed time the weeds will again make their appearance, when the paddock can be rescarified or disced, and then harrowed or springtoothed and drilled. I believe it would pay to summer fallow the more friable paddocks of this black land. A description of summer fallowing was included in the report of the Nhill Farm Competition for this year. (See *Journal of Agriculture*, January, 1920.)

The winning crop in this section had been reasonably well worked—especially had the operations been given at the most seasonable time—a most important factor in securing the necessary tilth. In working fallows after rain too great a time should not be allowed to elapse before commencing the operation. Dry working should be avoided. I do not think that the necessity for early sowing is so important on this class of soil when once the crab-holes have been levelled, as it is on the light land. On the Wimmera plains it is found that, if sowing is deferred until after the first good rains, much cleaner and heavier crops can be grown. The reason is that the rain helps in the consolidation of the soil, and particularly in germinating wild oats and other rubbish.

Where the land has been well tilled, and the sowing is taking place from mid-May to the first of June, the best of Wimmera farmers are finding 1¼ bushels of seeds and 112 lbs. of superphosphates the most profitable. Penny wheat, which has a fairly large grain and starts somewhat slowly, certainly requires to be sown at the heavier rate.

At Goroke the crops are usually thin and dirty, the heavier seeding should therefore be an undoubted advantage.

Several of the crops were smutted. This can be avoided by careful pickling. A full account on the pickling of wheat appears in the report of both the Dimboola and the Nhill Crop and Fallow Competitions. (See *Journal of Agriculture* for January and February of this year.) The seed wheat is becoming increasing full of strangers, and will shortly require to be renewed.

Crops on the Light Soil.

One of the most debated points at Goroke is the best method of cultivating the fallows. Some aver that no working whatever is necessary, and that the fallow is better left in the sod throughout the summer—but others contend that it should be given thorough spring and autumn cultivation. Of course it should be understood that the majority of the light land farmed is new land, and therefore troublesome weeds do not make their appearance for the first few years. It must be admitted that during the past two years—so far as one can judge—there has been little to choose between the two systems.

The heaviest crop this year was grown on well worked land, though the difference between that and the next crop which received the

minimum of treatment was not very great. Last year a crop receiving this latter treatment won the "light" section of the competition.

The number of crops examined are too few and too widely separated, however, to allow of a sound deduction being made, and the final test can well be left to the experimental plots.

In my report of last year I suggested that probably the time of sowing would be a specially important factor in determining wheat yields on these light soils.

The crops sown from mid-April to early May, as advocated, have during the past two years yielded quite a couple of bags to the acre more than crops sown later on. This year the two leading crops were sown at the end of April.

As on the light soils, I believe it would pay to increase the weight of seed sown to the acre, because of the poor germination and stooling shown by most of the crops.

Goroke soils show exceptional response to the use of superphosphate. 90 lbs. of super. is about the average dressing throughout the district. Where the drill accidentally failed to drop the manure, marked differences were seen last year. The view shown above was taken in Mr. Robertson's oat crop.

The most profitable amount of superphosphate to apply has never been determined for Goroke soils. The average amount used is about 90 lbs. The soils appear to be notoriously deficient in phosphates, and fertilizers could probably be increased with safety. The benefit of the heavy dressings to the herbage which comes when the land is spelled is notable.

In view of the fact that the light land is easily set down by the winter rains, and that most of the crops are regularly fed off to sheep, it should pay handsomely to harrow each paddock thoroughly after the sheep have been removed.

Increasing the Carrying Capacity.

Goroke has some fine flocks of Merino sheep, and at present much of the cultivation has for its ultimate object the provision of increased feed for the sheep—feed in the young growing crop, in the stubbles, and in the increased growth of grass, trefoil, wild oats, and rubbish which establish themselves when the paddock is rested.

Well informed land-owners are not slow to take advantage of the extra profits that accrue in this way, and they mostly allow fresh portions of their holdings to be cultivated from time to time on the share system. They will find it profitable to stipulate that heavy dressings of superphosphates be applied with the wheat, and liberal cultivation given on the black soils. The bulk and quality of the herbage is improved by cultivation and manuring on both classes of soil, and on the crab-holey land the cultivation in addition gradually tends to level it.

The more frequent the cultivation, the more effective the levelling.

There is no good reason why it should not pay to take much more definite steps to cheaply increase the sheep feed than those quoted, especially in view of the present high level of wool prices.

In the Western Wimmera there are large areas covered with "Black Grass" (*Lepidosperma lineare*). This sedge is practically useless as sheep feed. The illustration shows how it may be entirely eradicated by the growth of a crop or two of wheat or oats. When the land is spelled useful native grasses re-establish themselves as a result of cultivation and manure.

There are two general methods by which the improvement might cheaply be made: they have been referred to in previous reports. The first is the sowing of some plant with the last cereal crop prior to spelling the land, and the second is the application of superphosphate directly to the grass land.

The King Island meliot is a plant which can be cheaply purchased, and which should do well for a year or two if sown with the wheat at the rate of ½ lb. or so to the acre just prior to letting the paddock out. There is no doubt that the plant would do well on the heavy soils just as it does on the black soils of the Wimmera. The Wimmera rye grass is another plant which is worth testing, though if the land is required again for wheat this grass should be introduced with some caution. A full

account of this plant and the habits is given in the *Journal of Agriculture* for March, 1919. Messrs. Caldow Brothers sowed some at the rate of 1½ lb. to the acre with their wheat on a poor paddock which is about to be spelled, and the growth of the grass has been remarkable. The area sown was 150 acres in extent, and the behaviour of the grass during the next few years will be well worth watching by those interested. Judging by its performance in other districts, it should readily establish itself, but will require cultivating with a scarifier or disc every four or five years. As supplies of the seed of the true Wimmera rye grass are almost unobtainable this year owing to the grass being fed off

Messrs. Caldow Bros. sowed 1½ lbs. of Wimmera Rye Grass per acre with 150 acres of wheat on land intended to be spelled. The sample of rye grass shown is a representative one.

to stock, those desirous of testing the grass for themselves should obtain their seed if possible from this stand.

. . . .

In concluion, I have again to thank the President, Mr. F. O. Robertson, and others who provided the necessary transport, even though it necessitated stopping urgent operations in the field, and also those who extended the hospitality of their homes during the judging week. The farms visited are not as easy of access as in most other districts, and I would like to publicly commend the Secretary, Mr. David A. Vorwerg, to whose constant care and supervision the carrying out of the week's programme to a successful completion was due.

AGRICULTURE IN DENMARK.

By R. T. McKenzie, Dairy Supervisor.

While in England waiting for repatriation, the A.I.F. Education Service arranged a tour of a party through Denmark for the purpose of studying the methods adopted in the production of agricultural products, the co-operative methods involved in their manufacture and preparation for oversea markets. The writer had the privilege of being a member of the party, and some observations made during the visit may be of interest.

The unique position held by Denmark in the agricultural world is familiar to all.

Possessing no metalliferous undertakings, she has been compelled to exploit her soil, with such success that the history of Danish agriculture during the last 50 years reads like a fairy tale.

Denmark is not favoured with any great natural advantages; in fact, careful observation indicates that the soil is not rich, while the breeds of live stock, tillage methods and farming technique are no better than was seen in other European countries.

The reason for the success that characterizes the developments of Danish agriculture is primarily due to the wonderful system of co-operation. Up till the year 1860 farming in Denmark differed little from that of other European countries, and was a combination of meat and corn production.

For economic reasons, the Dane turned his attention to dairy farming, and his foresight was justified, for when the cheaply-produced grain and other agricultural products from America and Australia flooded the Old World markets, almost every country in Europe suffered a considerable set-back. Denmark, on the other hand, not only maintained her position, but became established as one of the great dairying countries of the world. That this combination of producers has been instrumental in cheapening the cost of production in the improvement of the finished article, in the elimination of the middleman, in increasing the return to the farmer, and in improving the lot of the farm hand, can hardly be questioned. The organization of producers is now very complete, and owes its strength to the fact that the peasant farmer realizes that in combination with his fellows for mutual aid, he is in a much better position than if he had to bargain for himself.

While co-operation is mainly responsible for the success of Danish agriculture, other considerations, such as land tenure, educational facilities, social conditions, and small holdings, have played an important part. Denmark is essentially a country of small holdings, 80 per cent. of the farms containing less than 150 acres. Out of a total of 250,000 farms, only 800 are over 500 acres, and the tendency for many years has been for a reduction in size. The tenant system of occupancy is rare, 90 per cent. of the farms being freehold.

Formerly, the organization of the social life of the Danish peasant was such that many civic duties were performed in common, and the community of interest thus inculcated formed a firm foundation for the subsequent development of the modern co-operative enterprise.

The Dairying Industry.

The Rural High Schools, and facilities for acquiring scientific agricultural knowledge, cannot be overlooked as a factor in the success of the movement. The first co-operative creamery in Denmark was founded in 1875 by several farmers, at Kaslunde, on the Island of Funen. Although fairly successful, it was not until the success that attended the establishment of the Hieding Co-operative Creamery, in 1882, that a fillip was given to the movement, which soon spread its ramifications throughout Denmark, and revolutionized dairy practice.

Through the instrumentality of the co-operative creameries, it was possible for the dairy farmer, no matter on what scale he dairied, even if only one cow were milked, to obtain the very highest price for his product. Moreover, it made possible the manufacture of a uniform quality of butter, and so make a reputation on the English market. We visited several of these creameries. There is nothing about the architecture worth mentioning. With the exception of the widespread use of the pasteurizer, the plants are similar to our own. The law provides that all cream intended for the manufacture of export butter must be pasteurized. The regenerative principle is utilized, that is, the incoming cold milk is used to cool down the milk that has already been heated to the high degree of 185 degrees F.; at the same time, the cold milk on its onward course is heated correspondingly.

The Danes claim, and experience would seem to justify the claim, that the only way of eliminating bad flavours and getting a uniform quality of butter is by pasteurization. Under another legal enactment, surprise butter exhibitions are held weekly. The butter is called up by wire, the water content determined, and the product judged by a committee consisting of nine judges, viz., 6 merchants, 2 dairy managers, and 1 consulting expert. In the provinces, exhibitions are held periodically, and judged similarly, but in these instances the factory is made aware when the butter will be called in.

Special dairy schools are in existence for training managers in all the intricacies of dairy science. It is almost impossible to obtain a position in a butter factory without the diploma of one of these institutions. The butter is put up in casks containing 100 lbs., which bear the "Lur Brand" trade mark. This is a compulsory mark for all butter intended for export, and no inferior butter is allowed to leave the country. The bulk of Danish butter is exported to England, practically the whole of it being sent direct to the retailers. It is not only produced co-operatively, but sold through co-operative channels. It may be said truly that no other butter-producing country sells its product to consumers in another country at so small an advance on the original price received by the farmer. The writer visited Tooley-street market several times in London, and saw butter from many countries pass through the hands of agents, but not a solitary cask of Danish butter. Very little milk is separated on the farm, and that is, no doubt, a factor in the production of a high-class butter. All skim milk, according to law, must be heated to a temperature of 176 degrees F., before being returned to the farmer. The danger of spreading tuberculosis is minimized greatly in this way. There are over 1,200 co-operative creameries in Denmark, having a turnover of about £21,000,000.

THE CATTLE.

The chief breeds of cattle number four, viz., Black and White Jutland, Red Danish, Shorthorn, and Jersey. The two former are native breeds, and the two latter imported. The Black and White Jutlands are found in the north of Jutland, and are regarded as dual purpose cows. The characteristics of the breed are its black and white or grey or fawn colour, a big frame, with capacious belly, udder well developed fore and aft, wide between the hips, hide soft, and hair fine; a vigorous cow, always in good condition. The milking capacity, of course, depends on the family, individual, and breed. In a good herd, the mature cow would average about 7,000 lbs. of milk, with a fat test of 3.2. The Red Danish is found in the south-east of Jutland, and the Islands of Lolland, Langeland, and Funen; in fact, the majority of the cows belong to this famous breed. They are of the dairy type, and of a beautiful red colour, with a harmonious frame, udder well developed, and splendid teats. They possess to a large degree the power of transmitting to the progeny their milking propensity. The Red Danish is more productive than the black and white breed for dairying, but not so good for beef.

The Shorthorn is, of course, well known, and in some districts of Jutland has a high reputation as an animal of quick growth, of good beef qualities, and a good milker. Jersey cattle are scattered all over Denmark. They have made great headway during recent years, and one well known stock expert ventured the opinion that the Jersey, in a few years, would be the principal dairy animal in that country.

The high productiveness of Danish cows is recognised the whole world over. That reputation has been achieved through the agency of two very ingenious co-operative undertakings initiated some few years ago—The Cow Testing Association and Bull Clubs.

HERD IMPROVEMENT.

The object of the Cow Testing Association is to let the farmer know the amount of milk and butter each cow produces, so that he can discard the unprofitable members of his herd, and use the best cows for breeding purposes. The Dane, while recognising the importance of the various points indicating milking qualities, requires more exact knowledge as to the milking capacity of the cows. The Original Control Society, as they are called, was established in 1895 at Vejen, Jutland. When the first report of the operations of the society was made available by Mr. Jens Johansen, it startled the whole dairying community. The report stated, *inter alia,* that while with the best cow it cost 6d. to produce 1 lb. of butter, in the case of the poorest it cost 2s. 8d. An example was given of two cows that stood side by side in the shed, both getting exactly the same feed, care, and attention. No. 1 gave 7,810 lbs. of milk, with a butter fat test of 4.26, equalling 385 lbs. of butter; No. 2 gave 8,226 lbs. of milk, with a test of 2.93, producing 280 lbs. of butter. Although No. 2 gave 416 lbs. more milk, No. 1, with her higher test, yielded 105 lbs. more butter. Such a revelation caused the movement to spread, and to-day there are about 700 Cow Testing Associations, with a total of 16,500 members, owning 225,000 cows. Some of the more advanced societies also keep records of the amount of food consumed by each cow. The following figures show the increase in the

average yearly yield of butter-fat per cow between the years 1854 and 1918:—

1854 at 44 lbs.
1861 at 68 lbs.
1871 at 96 lbs.
1898 at 129 lbs.
1903 at 173 lbs.
1914 at 215 lbs.
1918 at 240 lbs.

As might be supposed, the greatest increase has taken place since the initiation of the Control Societies; and, according to the latest figures available, the average yield per cow is 240 lbs. The Australian average is estimated at about 150 lbs., so we have a long way to go to reach the Danish figures.

Mr. Lars Frederiksen, one of Denmark's foremost stock experts, gave some information about the work of these associations. The work of the society is done by a Control Assistant, who is specially trained for his duties at one of the Agricultural High Schools. The tester visits the farm, identifies the cows, weighs the milk yielded during 24 hours by each cow, tests a composite sample for butter-fat content, and enters the figures in a record book, in which a page is set apart for each cow. This is done fortnightly. The tester, also, during his visit, marks any calves born since his previous visit, notes the date of birth, sex, also the names of sire and dam.

Reports of the year's working are furnished, and dealt with in this way:—In the first place, all cows that have produced 385 lbs. of butter are picked out; secondly, if they had a herd-book bull as a sire, a card is filled out as a record. This is considered very important, so that information may be available as to which of the herd-book bulls give the best offspring as far as milk and fat production is concerned. It is found that there is a great variation in value of bulls as sires—the offspring of some bulls give less milk and butter than the mothers did. Mr. Frederiksen gave an example of such a bull with a negative breeding value. A bull, herd-book No. 1529, had eleven daughters tested on an average; the eleven daughters, after their first calving, produced 5,291 lbs. of milk, 3.42 test, and 180 lbs. of butter-fat. The dams of those young cows, after their first calving, produced 6.017 lbs. of milk, of 3.75 test, and 225 lbs. of butter-fat. In other words, the offspring produced, after their first calving, 726 lbs. of milk, of 0.33 test, and 45 lbs. of butter-fat less than their dams did. On the other hand, a bull named "Emb. Britten," had eighteen daughters, the average production of which in six years was 6.809 lbs. of milk, 3.71 test, and 281 lbs. of butter-fat. The dams of these eighteen cows in six years averaged 6,140 lbs. of milk, 3.36 test, and 206 lbs. of butter-fat This means that the bull "Emb. Britten" increased the production of his daughters by 75 lbs. of butter-fat per year; whereas herd-book No. 1529 had decreased the yield of his daughters by 45 lbs. per year.

The Bull Clubs and Control Societies work hand in hand, their aim being the improvement and development of dairy cattle by purchasing bulls of a recognised breeding strain, and running them with the best cows. In this way, the improvement of dairy cattle, instead of being restricted to the big breeders who can afford to buy the best

sires, is shared by the smallest farmer, who has his cows served by the very best bulls available through the Bull Club. In 1918, there was 950 such clubs, owning 1,050 bulls, with 25,000 members, in possession of 250,000 cows. No bull belonging to the dairy type can get a prize at a Danish show unless his dam's record is known. In the show catalogue, the female ancestors' records are furnished, and the bulls judged from three different stand-points, viz.:—(1) The animal itself. (2) The records of his female ancestors. (3) The pedigree. In some classes the bull is judged on his progeny.

FEEDING.

Every care is taken that the cows are well and economically fed. When grazing, they are tethered and given limited radii in which to graze, and the picket pegs frequently shifted. The large amount of roots fed to cows in Denmark is surprising; in fact, they form the bulk of the ration in hand feeding. A typical winter ration for a cow producing 25 lbs. of milk or over is 5 lbs. of oil cake, 2½ lbs. of hay, and 80 lbs. of roots.

The Pig Industry.

This is a very important industry. There are about 50 Co-operative Bacon Factories, which slaughter 2,000,000 pigs yearly.

The chief breed is the Danish Native White, a fast-growing pig, with a long-snouted head, drooping ears, fairly long neck, somewhat light in the shoulders, long flat body, and good hams. They are very prolific, and good mothers, having an average litter of about eleven. The large Yorkshire is also prominent, and is used largely for crossing in order to produce a bacon suitable for the English market. Breeding "Centres" for the purpose of improving the swine have been established throughout Denmark. We visited the one at Langeskar. The object of the "Centres" is to test pigs as regards their thriftiness, fattening propensity, and quality of bacon, and if up to standard on these points to record them in the herd-book. The *modus operandi* is as follows:—A farmer wishing to have his pigs entered in the herd-book is visited by a committee appointed by the United Co-operative Bacon Factories, which inspects the pigs proposed for entry. This committee judges the pigs' fitness, type, and general appearance. If considered satisfactory, four of their progeny are sent to the breeding "Centre." Here they are fed in separate sties. All food given is weighed, and each animal's weight registered fortnightly, and its progress noted. The standard demanded is that a pig should grow to about 200 lbs. weight in from six to seven months, after consuming about 700 "food units." The expression "food unit" is a Scandinavian term, and represents 1 lb. of grain or its equivalent, 6 lbs. of skim milk, 12 lbs. of roots or 7 lbs. of green lucerne, and ¾ lb. of various oil cakes.

If the progress of the selected pigs and the quality of the bacon after slaughtering is deemed satisfactory, a second or confirmatory test is made from a second litter of the same parents. If the results are still satisfactory on the passing of this double test, the parents are eligible for entry into the herd-book.

The whole scheme is very economically worked. The manager of the "Centre," who is usually a farmer himself, pays one-half the market

value for the young pigs, and gets the full proceeds from the factory after slaughter. This compensates him for the work and care involved. It may be pointed out, incidentally, that Australia has contributed very materially to the success of the Danish pig industry, as a large proportion of the offal from our wheat milled in England is exported to Denmark, and furnishes pig-farmers there with cheap concentrated food.

The Poultry Industry.

This has developed enormously during recent years. Egg production is the main object. The Danish Co-operative Export Society is responsible for the great reform in collecting and marking of eggs which has given the product such a good name on the English market. The society was formed in 1895 by a village schoolmaster, Mr. F. Möller. It now has branches all over the country.

The eggs are brought by the producer to the "Circle"—which is really a receiving depôt—to which he belongs. Each "Circle" and its members have distinctive numbers. The collector marks the eggs with a rubber stamp bearing the identifying number of the member and the "Circle" to which he belongs, so that in the event of a defective egg being delivered the sender can at once be identified. Under the by-laws of the local "Circle," every member is bound to deliver all fresh eggs, except those used in the household for domestic purposes. The eggs must be collected daily from the nests, and sent at least once a week to the "Circle," members being liable to a fine if eggs older than seven days are delivered. Aggravated offences are met by expulsion.

From the local "Circles," the eggs are forwarded to the export centres, where they are graded into five groups, viz.:—14, 15, 16, 17, and 18 lbs. respectively to the long hundred (120). They are tested for soundness and freshness. Each egg is hall-marked with the Society's brand. They are then packed in cases containing twelve long hundreds (1,440).

In 1895, the first year of the operation of the Society, the turnover was 95 tons; in 1915 it had increased to 4,660 tons. In 1895 the export of eggs from Denmark to the United Kingdom was valued at £385,000. Twenty years later, the value had increased to £4,000,000, and in this period prices rose from 8½d. to 1s. per dozen. The turning point of the egg industry, which ranks fourth highest among agricultural products, synchronizes with the establishment of the Co-operative Society.

Beet Sugar.

The growing of sugar beet is a thriving industry. The area devoted to its culture in 1888 was 18,000 acres; in 1901, it was 37,000 acres; and in 1918, it had increased to 80,000 acres. Eight hundred and thirty thousand tons of beet were grown last year, and produced, approximately 150,000 tons of sugar. The Maribo Sugar Factory, which we visited, has a ten years' contract with the growers, paying about 25s. per ton for roots. Fifty per cent. of the profits is distributed amongst the growers apart from any amounts they receive as shareholders. During the war, the contract conditions were altered, and as high as 50s. per ton was paid for beet. The "pulp" is returned to suppliers for use as a cattle food, and is highly esteemed by the dairyman, special pits being constructed for its storage. The lime precipitate used during the clarifying process is applied for ameliorating the soil.

The company runs narrow-gauge railways through the district for carrying the beet to the factory, and appoints supervisors at various places to instruct the farmers in the most approved methods of culture. Experiment plots have been established for raising a beet with a high sugar content. An average crop is about 12 tons to tthe acre, yielding about 2 tons of sugar. Most of the work in the fields is done by Polish women.

The State Seed Testing Station.

One of the most interesting institutions visited was the State Seed Testing Station, the oldest and largest of its kind in the world. It is situated close to Copenhagen. The Director, Professor Dorph-Petersen, described the work of tthe institution when showing us round. He stated that investigations made in 1871 into the miserable conditions of Danish pastures disclosed the fact that it was the poor quality of seed sown that was largely responsible. Samples of clover and grass seeds taken from farms in different localities showed only 25 per cent. of pure seed able to germinate. In other words, for every 4 lbs. of seed purchased, results were obtained as from 1 lb. of pure seed, the bulk consisting largely of rubbish in the shape of chaff, sterile seed, and seeds of other plants. The outcome was the establishment of the Station, and results have justified its existence, not only to the farmer in protecting him from the sale of valueless seed, but to the seed-growers and honest seed merchants as well. The activities of the Station include investigations of the purity, germinating power, and weight of grain, as well as its water content and place of origin. In the determination for purity, an average sample of at least 1,000 seeds is taken. The sample is spread over a glass plate, and carefully examined with a scalpel and magnifying glass. During the process of examination, the sample is divided into four groups, viz.:—Pure seed, waste matter, seed of extraneous cultivated plants, and weed seeds. To the first group belongs all pure seed, no matter at what stage of development; the second group includes dirt, injured seed, pieces of plants, in fact all dead matter; the third group is made up of seeds of all plants other than the one under examination; and the fourth obviously includes all the seeds of weeds.

In the test for germination, the seed is placed on an apparatus made for the purpose. Both power and speed of germination are noted and indicated on the analysis chart. The object of determining the water content of seed is to ascertain if it contains more than the normal amount of water, as such seed must not be stored in bags for any length of time in a temperature exceeding 50 per cent. F., otherwise the germinating power will deteriorate. The test is made by heating a sample for about five hours at a temperature of 212 degrees F. to evaporate the moisture, and the residue is then weighed. The place of origin is generally determined by "character" seeds found in the samples which are peculiar to certain districts and countries. To calculate the amount of the pure seed able to germinate, the figures for purity and germinating power are multiplied and divided by 100. For instance, if a sample contains 90 per cent. pure seed, and has a germinating power of 80 per cent., the result is 72 per cent. of pure seed able to germinate.

The State Seed Testing Station has an agreement with the controlled dealers, who bind themselves to submit to the Station the name of all home purchasers of certain seeds at the time the seed is sold. From

these purchasers the Station selects addresses, and a request is made to furnish a sample. Samples are also taken from the seller. If the result of an analysis is not in accordance with the guarantee of the seed merchant, redress is demanded. Seventeen of the co-operative societies and private seed merchants, who handle two-thirds of the seed used in Denmark, submitted to the supervision of the Station in 1918-19. It is safe to say there is no other country in the world where such care is exercised in the control of seed used by the farmer, and this attention has been largely instrumental in the success of seed culture in Denmark. In 1907, 10,000 acres were devoted to raising grass seed, seeds of various legumes, and seeds of the cabbage family. In 1912, it had increased to 29,000 acres, and in 1918 to 65,000 acres. A considerable amount of seed is grown for seed merchants on the share system. The merchant supplies the pure seed, which the farmer undertakes to grow under the most up-to-date methods of culture, and to supply the yield to the merchant only. Another condition of this share system is sometimes the growing in isolation of crops subject to cross-fertilization Twenty per cent. of seed after the harvest goes to the seed merchant. and he has the option of the balance at market rates. One big seed firm visited had 200 growers supplying seed under these conditions.

Waste Lands.

A striking feature of Danish industry was seen in the reclammation of moorland or heath country in North-west Jutland. In the war with Germany in 1866, about one-third of the Danish territory was seized. The Dane, therefore, had to turn his attention to utilizing what had been considered waste land. The problem of reclaiming the moors had been attempted before in many other European countries, but the task had been given up as hopeless.

Denmark, after the loss of her rich provinces, however, was forced to make another attempt to make the heather-covered moors profitable. A Society was formed, known as the Danish Heath Society, led by Captain Dalgas, and the problem tackled with great energy. We were driven through many thousands of acres which, less than 50 years ago, were a desolate waste, but which to-day are planted with great pine forests, with here and there homesteads surrounded by green fields, having every appearance of prosperity. The work of the Society is subsidized by State and private subscriptions. It divides itself into several sections, pine forests, arable land, meadows, and peatmaking. The procedure adopted in reclaiming the land varies slightly according to whether it is peaty or sandy. Generally it consists of draining, and burning the heather. The land is then ploughed and left exposed to weather conditions for some time. It is then ploughed again, and dressed heavily with marl, 2 tons to the acre usually, 100 lbs. of 37 per cent. kainite, and 100 lbs. of 18 per cent. super. It is sown with a trial crop of oats and peas, and after harvesting, the land is not ploughed but harrowed and sown down with pasture grasses. A top-dressing of artificial fertilizer is given annually. Since the Society started operations in 1866, the area of moorland turned to profitable account exceeds 1,000,000 acres. While it may be inaccurate to say that at present there are no waste lands in Denmark, it can be said that in another generation, with the same progress as that of the last thirty years, there will be not a foot of land that is not put to its most productive use.

Agronomy.

The agronomic conditions are influenced by the fact that practically the chief aim in the cultivation of the soil is in producing forage crops for feeding purposes. Lucerne is grown largely. All cropping is centred in the idea of keeping the soil in a fertile state. A typical rotation extends over eight years, and is as follows:—Wheat or rye, root crop, barley, root crop, oats and vetches, barley, clover and grasses.

Farmyard manure plays a large part in soil fertility, and is called by the Danes their gold mine. It is stored either in heaps or sheds. Liquid manure is considered very valuable, and is collected and stored in tanks. A spreader, similar to a water-cart, is used for its application to the land. Marl is in great demand, and a lot of money is spent by the State in developing deposits. There are two large Co-operative Marling Societies, which last year supplied to their members 1,000,000 cubic yards.

Agricultural Education.

This is given great prominence. People's High Schools, Agricultural Colleges, Schools of Domestic Economy, are scattered throughout the land.

Very little practical training is given at any of these institutions; that is left to private resource. Some of the farmers, of course, get practical training on the farm; in other cases, boys are apprenticed for three years to well-known farmers. The Government grants a subsidy to apprentices engaged in draining, irrigation, crop growing, and animal husbandry. The schools are chiefly located in the country districts; most of them are run as private ventures subsidized by the State, according to the number of pupils. A characteristic feature of the Danish social policy is to combine private and State effort. The initiative is taken by the individual, and if deemed worthy, State assistance will be given. This is exemplified to a large degree in the education system. The Ladelund Dairy School, famous for the work of some of its old pupils, is owned by a limited company. The directors are elected by the shareholders, and with three teachers, appointed from the staff, are responsible for the management. The courses, which are short, are held in the winter months. The curriculum includes instructions in dairy practice, chemistry, dairy bacteriology, animal husbandry, and the work of "Control Assistant." A feature of the school is the agricultural and dairy museum, where the evolution of the most primitive appliances to the most modern can be seen.

Agricultural councillors are appointed, who travel in the rural districts to advise in plant culture, dairying, animal husbandry, plant diseases, forestry, &c. There are about 100 such officers. Lectures by these experts are always well attended. The Dane not only does things, but he wants to know why he does them. An example was noticed one day when a queue of farmers were waiting admission to the already overcrowded hall to hear a lecture by one of the experts. Rather a contrast to our own country, where the farmer seems very loath to take advantage of the facilities at his disposal, due, no doubt, to psychological and temperamental differences. And it is this spirit of inquiry, with a capacity for taking trouble, that has led to the intense development of Denmark, until to-day she is able, though only half the size of Tasmania, to support a population of 3,000,000.

PEAR GROWING IN VICTORIA.

By E. Wallis, Orchard Supervisor.

Ensuring the Crop—Cross Fertilization.

(Continued from page 93.)

If profitable crops of pears are to be consistently produced, the orchardist must plant varieties which mutually influence each other in the vital process of fertilization, for if this be not accomplished crop failure is bound to result.

It is an established fact that some varieties are very prone to self-sterility, and in fact varieties which may usually be classed as self-fertile are in some instances in need of cross-fertilization in order to enable them to set their crops.

Therefore in order to guard against the risk of varieties not proving self-fertilizing, it is well at the outset to inter-plant varieties which it is known will cross, or which, at any rate, are of nearly simultaneous blooming habit, thus minimizing the risk of crop failure.

Many of the orchards planted during the last decade have been arranged on these lines, and the beneficial results are already noticeable in them. Varieties, which under the old system of planting without due regard to interpollination failed to set profitable crops of pears, are now found under the new order of planting to yield remarkably well.

The Kieffer variety is perhaps the most noted self-sterile variety grown in this State, and up till ten years ago it was quite common to find large areas planted with this pear, which, although the trees were ten or fifteen years old, had never yielded any profitable quantity of fruit. In fact, many trees in the Diamond Creek and other fruit-growing districts had absolutely failed to bear crops.

In consequence of this unsatisfactory condition of things the matter was taken in hand in the season 1910-11, when acting under instructions from the present Chief Orchard Supervisor, Mr. P. J. Carmody, the writer, with the assistance of the other orchard supervisors stationed throughout the State, compiled a list of the blooming times of fruits. This list, with other data concerning experiments and observations relating to sterility in fruit trees, was published in the *Journal of Agriculture*, January, 1911.

In the experiments referred to, Kieffer, on account of its proneness to sterility in fruiting, was selected for the purpose of experiment by cross-fertilization at the orchards of Messrs. W. G. Gray, G. Middleton, and C. Millthorpe, in the Diamond Creek district. The varieties used for crossing with the Kieffer were Beurre d'Anjou, Harrington's Victoria, Howell, and Le Conte, small limbs of bloom of these varieties being placed in the centres of Kieffer trees in vessels containing water, whilst in some cases hand fertilizing of the Kieffer blooms was adopted.

The results were quite remarkable, for the trees treated responded by setting a heavy crop of pears, especially those in near proximity to the introduced blossoms, or where hand fertilizing had been done, each of the varieties mentioned proving equally effective as a cross. One grower stated, "The Kieffer pears set like grapes where the other blossoms were put in the trees."

Plate No. 48 shows one of the Kieffer trees treated in these experiments, and Plate No. 49 a section of same. It will be seen that this

tree has set a heavy crop which, although about ten years old at the time, had not previously borne any appreciable amount of fruit, in fact had been almost a total failure.

Plate No. 50 shows the adjoining tree of same variety which failed almost entirely to set its crop during the season in which the experiments were conducted.

Profiting by the result of these experiments, growers in whose orchards these profitless patches of trees existed cut some of the trees

Plate No. 48.—Kieffer Pear Tree, 10 years old, bearing first crop of fruit as a result of cross-fertilization.

back, and worked them over with one of the several varieties mentioned so as to provide the necessary crossing medium. In some cases twigs on the affected trees were grafted in the same way, but this did not prove as effective as the other method. Plate No. 51 shows a young Kieffer tree treated by the latter method, the pieces of white calico tied round indicating where grafts were made.

By the mistakes made in past plantings, and through the consequent observations and experiments to remedy these mistakes, the prospective pear-grower is now able to so arrange the trees in his orchard that the beneficial effect from cross-fertilization may be obtained.

Causes of Sterility in Pear Trees.

The cause of self-sterility in pear trees in a general sense is due to the impotency of the pollen of one particular variety upon its own pistils.

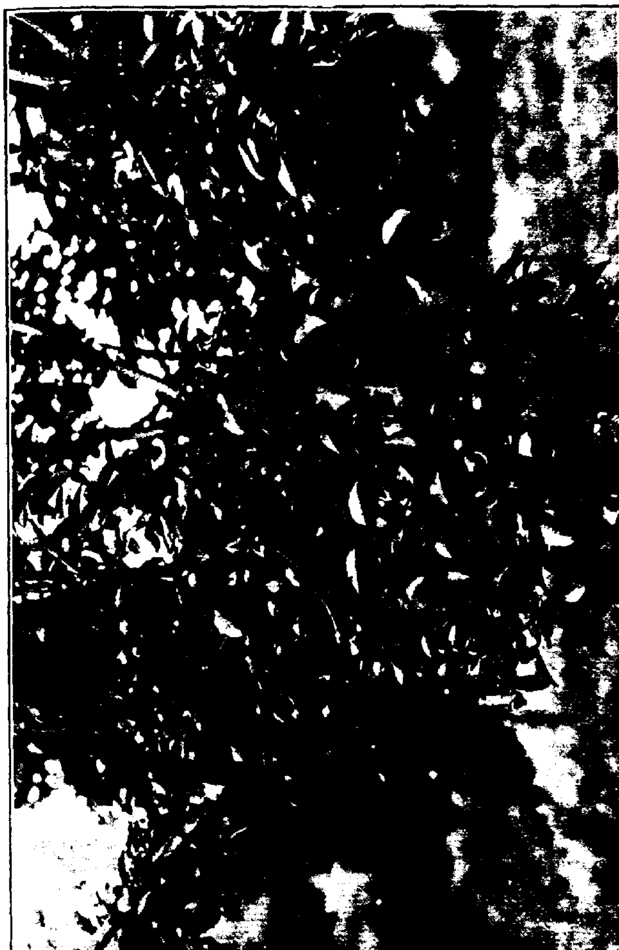


Plate No. 49.—Section of tree illustrated in Plate No. 48.

This impotency may be brought about by over-blooming on the part of the affected trees as seen in Plate No. 52 or by other causes more or less obscure, and although partial remedies such as spur-pruning may be productive of much good in assisting trees to set their fruit, yet with some varieties there appears to be a natural abhorrence to self-fertilization.

The writer has noticed particularly that the reproductive organs of some self-sterile varieties are, as a rule, physically perfect, the anthers being in a dehiscent condition, and the pollen liberally disseminated at the time when the stigma is in a receptive state, yet no fertilization of the ovules takes place, and the blossoms simply wither and fall off. This points to lack of germinal power on the part of the pollen itself. Thus it will be seen that although pollination may take place, this may not bring about fertilization, which is vitally essential to the setting of the fruit.

Plate No. 50.—Ten year old barren Kieffer Pear Tree.

In connexion with this matter other officers have made observations, and state as follows:—

Supervisor Hammond (Doncaster district).—"The result of a careful examination of the carpels, anthers, stamens, pistils, and stigmas of the 'shy' varieties was of a negative character, and up to the present time I cannot account for their infertility. An examination of the flowers of the different kinds of trees which failed to set their fruit did not disclose any defect in the essential organs of reproduction."

Supervisor Farrell (Evelyn district).—"I have not been able to detect any obstruction in the pistil tubes except in cases such as the sudden dying off of the stigma as, for instance, the Marie Louise pear before the pollen was ripe. This is not so noticeable in other kinds."

Plate No. 51.—Young Kieffer tree. Two limbs grafted with Howell to provide for cross-fertilization.

To illustrate the actual process of fertilization, a diagram of a cistus flower depleted of its sepals and petals is shown. The sexual or reproductive organs of this flower are as follows:—(A) The stamens or male organ of the flower. At the tips of the stamens, marked (a), may be seen the anthers containing the pollen. When these are quite matured they break open, and the pollen is liberated, and they are then said to be in a dehiscent condition.

In the centre, marked (B), is the pistil, and at its end, marked (b), is the stigma, usually covered with a glutinous substance, which arrests the disseminated pollen, and enables it to do the work of fertilization.

Plate No. 52.—Pear Trees overblooming—a cause of sterility.

This is effected by the pollen grains, seen adhering to the tip of the stigma, germinating and sending their delicate pollen tubes down through the pistil and impregnating the ovules (as may be seen in the illustration). When this is accomplished, but not before, fertilization results.

It will thus be seen that the process of fertilization is of a very exacting and delicate nature, and depends upon (1) the perfect bisexual structural arrangement of the bloom; (2) the germinal power of the pollen; (3) the proper condition of the reproductive organs of the flower at times of fecundation. It is rare to find blooms of the pear unisexual, and this cause of sterility need not, therefore, be considered.

Other factors influencing the fertilization of blooms are—(*a*) fine sunny days during blooming period; (*b*) activity of bees and other insects.

The importance of fine weather during blooming time cannot be overestimated, for in the presence of sunshine bees and insects are generally flying from flower to flower in search of the sweet secretion called nectar, and their presence assists materially in the work of cross-

fertilization. Mr. R. Beuhne, in an interesting article on "Bees and Fruit Fertilization," says—"To get at the nectar the bee has to pass over the anthers, and the pollen grains adhere to the many hairs covering its body; in visiting the next flower some of the pollen falls on the stigma, and thus fertilizes the blossom, even if the bee is not gathering pollen. In gathering pollen the bee sweeps together the pollen grains with its moistened tongue, nips it off the tongue with the front pair of legs, passes it on to the second pair of legs, and finally on to the third pair, where it lodges on what is called the pollen basket, a covering of stiff hair below the upper joint. In this performance pollen grains become scattered all over the body of the bee, and as it has to visit many blossoms before it gets the amount it can carry, and passes over the stigma of every flower, pollination is always brought about. If the bee visited the blossoms of different species of plants in the same excursion there could be no cross-fertilization, because strawberry blossom, for

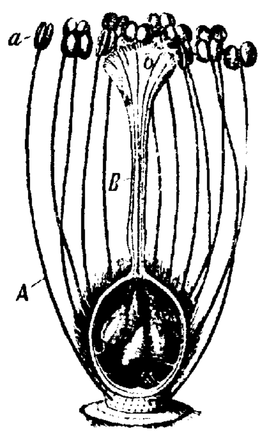


Plate No. 53.—Essential reproductive organs of Cistus flower showing fertilization of ovules.

instance, could not fertilize pear blossom. It is, however, a well-known fact that a bee during one trip confines itself to one species of plant, whether in search of nectar or pollen, and a mixture of pollen is never found in any bee's load when it enters the hive. Plants of the same species, but of different varieties, are worked over during the same trip."

No comment is necessary to show how important is the work carried on by these silent and tireless workers, for congenial weather is the only condition they require in building up their hives, and in so doing assist the fruit tree to yield bountiful crops.

Blooming of Pear Trees.

It has been noted by the writer that in blooming the different varieties of pear trees produce both early and late blooms, and that the former are often spent by the time the late blooms on the same tree become effective as pollinators. With this provision of nature it is not vitally essential for two varieties to be quite simultaneous in their time of

Plate No. 54.—The bee and the blossom.

blooming. For in the case of varieties differing by several days in the time of their first blooms appearing, it is quite possible for such varieties to be of mutual assistance in the matter of cross-fertilization. This is owing to the late blooms of the earlier blooming variey being in a fecundative condition at the same time as the early blooms of the later variety.

The average time occupied in blooming by the different varieties is found to be from twelve to eighteen days, and the average time from first blooms appearing to the full bloom period is from six to ten days. From this data it will be seen that little assistance can be expected in the process of cross-fertilization from the earliest blooming varieties with late bloomers such as Williams' Bon Chretien; yet in California, according to a bulletin on the Pollination of the Bartlett pear (known here as Williams' Bon Chretien), early blooming varieties, such as Beurre d'Anjou, Howell, and Kieffer, are said to be successfully used as a cross with the Bartlett.

This shows that the varietal blooming times of pears in America must differ to some extent from those in this State, for here the early blooming varieties mentioned would be of little use in crossing with Williams' Bon Chretien compared with varieties such as Beurre Bosc and Broompark.

For the purposes of this article the writer does not intend to publish a perplexing list of dates of the blooming times of pear varieties, but will give necessary details of how the desired effect of inter-pollination may be achieved.

Amongst the varieties to be enumerated are some that are not of high commercial value, so that in choosing a variety to inter-plant it is advisable to select one that is of good commercial value in addition to its being helpful as a pollinator.

It is intended to divide the varieties into three sections in their order of blooming. Section (A) comprises those varieties of early blooming habit, Section (B) the intermediate, and Section (C) the late bloomers. To get the greatest effect from inter-pollination, it is advisable when planting a certain variety to choose another variety in the same section as a pollinator. Although some mutual benefit would no doubt be derived by planting varieties chosen from Sections A and B, or B and C, little could be expected from A and C. At any rate, although there are a good many details yet to be worked out as to the direct effect of one variety upon another, it is found that varieties which are nearly simultaneous in their blooming times give the best results as inter-pollinators.

SECTION A.

Bakehouse's Bergamot.	Howell.
Beurre d'Anjou.	Kieffer.
Beurre Clairgeau.	Lawrence.
Brockworth Park.	Le Conte.
Citron des Carmes.	Marechal de la Cour.
Easter Beurre.	Monchallard.
Forelle.	Poire de Berriays.
Garber's Hybrid.	St. Michael Archangel.
Harrington's Victoria.	

The best commercial varieties in this section are Beurre d'Anjou. Beurre Clairgeau, Harrington's Victoria, Howell, Kieffer, and Lawrence.

SECTION B.

Beurre de Capiaumont.
Beurre Giffard.
Beurre Diel.
Beurre Hardy.
Black Achan.
Brown Beurre.
Brown Windsor.
Catillac.
Clapp's Favourite.
Cole's Hybrid.
Doyenne Boussock.
Doyenne du Comice.
Durondeau.
Elizabeth Cole.
Fertility.
Flemish Beauty.
Golden Beurre.
Gansell's Bergamot.
Glou Morceau.
Idaho.
Jargonelle.
Urbaniste.
Josephine de Malines
Lady Lynn.
L' Inconnue.
Louise Bonne of Jersey.
Madame Cole.
Mount Vernon.
Napoleon.
Neverfail.
Packham's Triumph.
Pitmaston's Duchess.
Souvenir du Congress.
Summer Bon Chretien.
Swan's Orange.
Uvedale's St. Germain.
Vicar of Winkfield.
Winter Cole.
Winter Nelis.

The best commercial varieties in this section are Beurre de Capiaumont, Black Achan, Clapp's Favourite, Doyenne Bonssock, Doyenne du Comice, Durondeau, Gansell's Bergamot, Glou Morceau, Josephine de Malines, Madame Cole, Packham's Triumph, Souvenir du Congress, Vicar of Winkfield, Winter Cole, Winter Nelis.

SECTION C.

Autumn Bergamot.
Bailey's Bergamot.
Beurre Bose.
Broompark.
Laffer's Bergamot.
Marie Louise.
Williams' Bon Chretien.

The best commercial varieties in this section are Beurre Bose, Broompark, Marie Louise, Williams' Bon Chretien.

Planting the Trees.

When the young trees are received from the nursery it is a good plan to heel them in the ground at once in order to prevent the roots from becoming dry through exposure to the sun and wind. Many cases of trees failing to come away into thrifty growth after planting may be attributed to the dried-out condition of roots caused by their being too long out of the ground. A shallow trench should be dug in a well drained situation to receive the trees, the roots being covered with fine soil until time of planting the trees out in their permanent positions.

There is no gain in planting the trees too early, for trees hastily placed in cold wet soil are not benefited, but rather retarded in their subsequent growth. They should, if possible, be planted out just before the young rootlets begin to develop from the heavier root system, and in the southern portion of the State this growth may be looked for towards the end of July.

It is almost impossible when young trees are being removed from the nursery rows to guard against some interference with their root system, and frequently the roots are broken, leaving them with ragged ends. Before planting, therefore, these broken ends shoull be cut off cleanly; by so doing callusing will be facilitated, and the development of new roots promoted. When cutting off the ends of the young roots

the cut should always be made so that the callus and subsequent root development will have a downward tendency.

In order to secure accuracy in planting the trees, and to ensure their being quite in line, it is necessary to place the trees in exactly the same position as that occupied by the peg. This is sometimes done by sighting, but the better plan is to use what is known as the planting board. This may be made of a 5-foot length of ordinary 6 inch x 1 inch flooring board. A small peg-hole is made near each end of the board, and a notch in the centre as seen in the accompanying diagram (Plate No. 55).

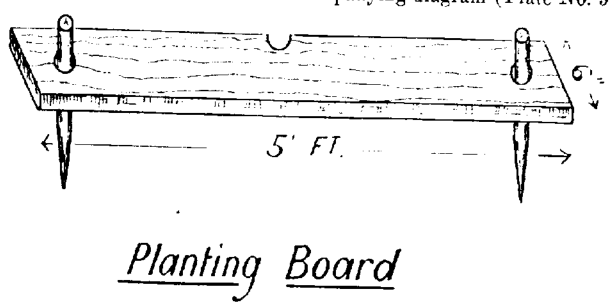


Plate No. 55.

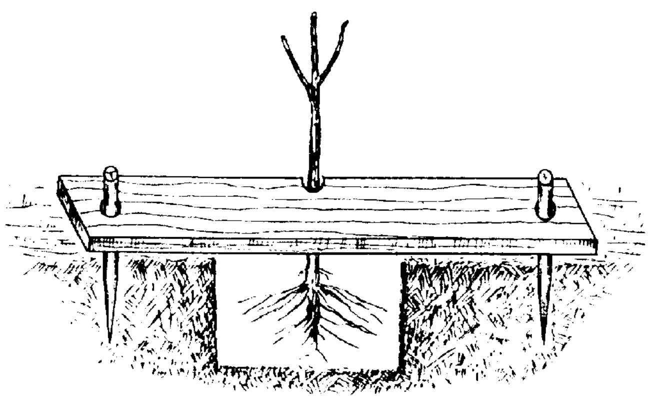


Plate No. 56.—Tree placed in position.

When planting operations are commenced, the notch in the centre and side of the board is placed at the peg, and an iron stake driven into the ground through each peg-hole near the ends of board. The board is then lifted off the stakes, which are allowed to remain in the ground. After the hole for the tree is prepared the board is again placed in position, the stem of the young tree being placed in the notch of the board, and the filling in of the hole completed. Plate No. 56 shows the board and young tree placed in position. Care should be exercised to see that the young tree is not planted too deeply in the soil, the proper depth being that at which the tree was established in the nursery. This

may be determined by the appearance of the bark on the stem. When filling in the hole round the roots fine soil should be used for the purpose, as if clods or stones are placed on the roots the compactness of soil necessary for root development is not secured.

By attending to these details in planting the necessary work entailed will be more than compensated for by the regular appearance of the rows and the growth of young trees.

(To be continued.)

SOUR SOIL.

Sour soil conditions arise from several causes: The alkalinity may have been reduced by cropping land without liming; the decaying process of the green roughage, manure, and other organic matter turned in, and the excretions of the plant roots, may all have helped to set up the acid condition. The acid condition has sometimes been charged to the continual use of chemical fertilizers, but the scientific men have exploded this theory. Dr. Wheeler, formerly Director of the Rhode Island Experiment Station, says:—It is well established that if a soil to which superphosphate has been added remains quite moist for a considerable length of time, the sulphate of lime which is associated with the superphosphate may be partly changed to carbonate of lime within the soil by processes of reduction. When this occurs, the carbonate of lime which is formed will naturally tend to lessen the acidity of the soil."

Recently, Professor S. D. Conner and his fellow workers at the Indiana Agricultural Experiment Station have shown that acid soils and silicates, after receiving acid phosphate, were less acid than when they were untreated.

They believe this is due principally to the re-action of the phosphoric acid upon salts of aluminum.

Director Brooks, of the Massachusetts Agricultural Experiment Station, has conducted field experiments with superphosphate covering a period of many years. He states that "no injurious secondary effects are known to be associated with any reasonable use of dissolved phosphates."

The question has been studied likewise by Professor G. H. Hite, of West Virginia University. He has tested hundreds of samples of soil from various parts of West Virginia, and reports that three-fourths of the sour soils and practically all of the sourest soils in that State have never had fertilizer.

It appears, therefore, that fertilizers, which some people have been condemning because they were supposed to increase soil acidity, really lessen it, and thereby actually improve their chemical re-action.

[Farmers' Union Advocate, New Zealand.

STANDARD TEST COWS.

Report for Quarter ended 31st December, 1919.

The cows which completed the test numbered 110, of which 93 qualified for certificates. Individual returns are as follow:—

J. BAKER, Gheringhap. (Red Poll.)

Completed since last report, 2. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Licho Lady	Not yet allotted	16·3·19	273	14½	7,138	4·82	344·21	250	392¼

Mrs. A. BLACK, Noorat. (Jersey.)

Completed since last report, 4. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Madge	3575	17·3·19	273	9	5,705	5·14	293·46	250	334½

CALLERY BROS., Bannockburn. (Ayrshire.)

Completed since last report, 2. Certificated, Nil.

Dr. S. S. CAMERON, Hawthorn. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Merella II. of Yarra Brae ..	5668	8·3·19	273	17	4,831	6·83	329·90	175	376¼

DEPARTMENT OF AGRICULTURE, Werribee. (Friesian and Red Poll.)

Completed since last report, 8. Certificated, 7.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Friesian.									
Dominion Milkmaid ..	714 N.Z. F.H.B.	14·3·19	273	36½	11,862	3·83	454·71	250	518¼
Red Poll.									
Aleutia	Not yet allotted	16·1·19	273	14	6,299	4·11	259·14	250	295½
Panama	"	20·1·19	273	23	8,460	4·14	350·01	250	399
Santa Clara	..	26·1·19	229	4	6,136	4·59	281·54	250	321
Gallipoli	..	29·1·19	263	4	6,312	4·00	252·67	2 0	288
Baltica	..	13·2·19	273	17	8,555	4·42	378·36	250	431¼
Tasmania	..	15·2·19	273	17½	7,820	4·19	327·77	250	373½

C. FALKENBERG, Elliminyt. (Jersey.)

Completed since last report, 3. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Fancy of Colac	4027	6·2·19	273	27	6,982	4·64	324·44	250	369¾
Trixie of Colac	4914	16·3·19	273	17½	5,553	5·48	304·16	200	346¾

W. A. FRANCIS, Kilcunda. (Ayrshire.)

Completed since last report, 2. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Red Rose of Fern Hill ..	Not yet allotted	14·2·19	273	18	6,306	4·11	259·31	200	295½

A. JACKSON, Glen Forbes. (Jersey.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Maitland's Floss	423 C.S.H.B.	4·1·19	273	16	5,553	5·22	289·91	250	330½
Graceful Duchess XII. of Melrose	5539	4·3·19	*191	15	4,526	6·19	280·35	250	319½

* Sold before completion of term.

S. A. JOHNSON, Woodend. (Ayrshire.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Molline of La Motte ..	5259	10·2·19	273	21	5,420	5·05	273·86	175	312¼

A. W. JONES, Whittington, *viâ* Geelong. (Jersey and Friesian.)

Completed since last report, 6. Certificated, 6.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Jersey.									
Jubilee XV.	5056	18·1·19	273	32½	10,412	5·20	551·67	250	629
Lady Grey V. of St. Albans	5038	22·1·19	273	23	7,418	5·43	402·65	200	459
Mermaid IV. of Melrose ..	6307	7·3·19	273	15½	6,170	6·44	397·09	200	452¾
Silver Queen II. of Colac ..	4032	17·3·19	273	24	6,770	6·21	420·52	250	479½
Friesian.									
Pauline	Not yet allotted	12·2·19	273	17½	9,931	4·06	403·29	200	459¾
Bolobek Bess	"	18·3·19	273	25¼	10,436	4·04	421·77	250	480¾

C. G. KNIGHT, Cobram. (Jersey.)

Completed since last report, 20. Certificated, 19.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Wattle of Tarnpirr ..	6040	*30.12.18	273	13	4,477	6·25	279·68	175	318¾
Lilac of Tarnpirr ..	6028	8·1·19	273	21½	6,772	4·79	324·96	175	370½
Beautie of Tarnpirr ..	6023	18·1·19	273	16	5,271	6·56	345·88	175	394¼
Cooee of Tarnpirr	6025	21·1·19	273	16½	4,906	6·66	326·85	175	372½
Good Day of Kameruka ..	6027	28·1·19	273	21	7,614	4·58	348·70	175	397½
Pidgeon of Kameruka ..	6035	6·2·19	273	20	6,933	5·54	383·93	175	437¾
My Queen of Tarnpirr ..	4209	8·2·19	273	11¼	5,803	5·77	334·98	250	381¾
Miss Fox of Tarnpirr ..	5162	11·2·19	273	21	6,576	5·62	369·32	200	421
Alice of Tarnpirr	4205	15·2·19	273	21¼	7,215	5·49	395·91	250	451¼
Princess May of Tarnpirr ..	5168	15·2·19	273	18½	6,390	4·83	308·40	250	351½
Christmas of Tarnpirr ..	4206	1·3·19	273	15½	5,694	6·13	349·32	250	398¼
Mistletoe of Tarnpirr ..	2984	1·3·19	†216	16	5,478	4·84	265·44	250	302½
Pastime of Tarnpirr ..	5164	1·3·19	273	13½	5,505	5·58	307·34	200	350¼
Romany Girl of Tarnpirr ..	5171	4·3·19	273	18	7,089	5·29	374·80	200	427¼
Veronica of Tarnpirr ..	5174	8·3·19	†271	21½	6,714	5·03	338·02	200	385¼
Wedding Bell of Tarnpirr ..	6041	10·3·19	†269	17	5,515	5·93	326·91	175	372¾
Bluebell of Tarnpirr ..	6024	15·3·19	†264	15	5,071	5·30	268·66	175	306¼
Postcard of Tarnpirr ..	5167	22·3·19	†257	16	5,518	6·20	342·43	200	390¼
Rosebud of Tarnpirr ..	4210	23·3·19	†256	18	6,029	5·76	347·31	250	396

* Calved prematurely. † Sold before completion of term.

J. A. LANG, ALVIE. (Ayrshire.)

Completed since last report, 3. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Docy of Yalart	3146	13·2·19	273	9¼	7,183	4·79	344·02	250	392¼
Peggy of Riccarton ..	Not yet allotted	14·3·19	273	5¾	6,753	4·86	328·04	200	373¾

H. LIDGETT, Myrniong. (Shorthorn.)

Completed since last report, 4. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Moss Rose XIII	Not yet allotted	10·2·19	273	8	6,520	4·31	281·51	175	321
Daphne XXI	"	3·3·19	273	4	5,021	3·90	195·93	175	223¼
Ruby II.	"	20·3·19	273	14	8,135	4·34	353·07	250	402½

C. G. LYON, Heidelberg. (Jersey.)

Completed since last report, 9. Certificated, 9.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Lassie VII. of Banyule ..	6069	2·1·19	273	12¼	4,127	5·69	234·99	175	267¾
Thora IV. of Banyule ..	6083	2·1·19	273	16¼	5,312	5·28	280·88	175	320¼
Melford Mascotte	5215	3·1·19	273	20	6,860	5·54	380·51	200	433¾
Statuette	4251	1·2·19	273	15	6,843	5·77	394·93	250	450¼
Ettie V. of Banyule ..	5204	7·2·19	273	22	7,548	5·38	406·03	200	462¾
Silvermine XIII. of Banyule	4250	10·2·19	273	22¼	6,854	5·20	356·79	250	406¾
Lassie VIII. of Banyule ..	6070	16·2·19	273	14½	4,984	5·46	272·11	175	310¼
Molly V. of Banyule ..	5216	27·2·19	273	17½	7,730	5·73	442·74	250	504¾
Starfinch III.	6082	27·3·19	273	12½	4,462	5·98	267·02	175	304¼

MEIER BROS., Box Hill. (Jersey.)

Completed since last report, 2. Certificated, *Nil.*

T. MESLEY, Dalyston. (Jersey.)

Completed since last report, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Shadow of Luscombe ..	6143	9·1·19	273	13¼	4,815	5·83	280·90	200	320¼
Keynote	5247	7·2·19	273	22¼	6,436	6·29	405·11	200	461¾
Garenne III. of Warenda ..	6140	16·2·19	273	11	3,777	5·80	219·18	175	249¾

MUHLEBACH BROS., Batesford. (Ayrshire.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Gracie of Retreat ..	5386	25·3·19	*261	11½	5,640	4·83	272·46	175	310½

* Withdrawn before completion of term.

Mrs. L. ORCHARD, Grahamvale. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Pansy of Grahamvale ..	5330	25·1·19	273	10	4,021	5·30	212·97	200	242¾

W. PARBURY, Warburton. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Sweet Alice	532 C.S.H.B.	5·1·19	273	9	4,960	6·18	306·45	250	349¼

R. RALSTON, Moglonemby. (Ayrshire.)

Completed since last report, 2. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Princess of Ben Kell ..	3054	20·3·19	273	12	7,498	4·43	332·09	250	378½

J. D. READ, Springhurst. (Jersey.)

Completed since last report, 8. Certificated, 8.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Verbena of Springhurst ..	5407	21·2·19	273	14½	5,663	5·15	291·43	250	332¼
Balsam of Springhurst ..	4376	3·3·19	273	15	6,508	5·29	344·61	250	392¾
Penstemon of Springhurst ..	6205	21·3·19	273	10½	4,613	5·18	239·17	175	272½
Czarina of Springhurst ..	4380	25·3·19	273	12	7,063	5·53	390·75	250	445½
Dolichos of Springhurst ..	6203	25·3·19	273	11	4,326	4·63	200·40	175	228½
Dauphine of Springhurst ..	6202	25·3·19	273	12½	4,308	5·83	251·12	175	286¼
Clover of Springhurst ..	6201	26·3·19	273	11	4,685	5·62	263·26	175	300
Daffodil of Springhurst ..	4381	26·3·19	273	13	5,819	5·77	335·57	250	382½

Miss BRUCE REID, Bundoora. (Jersey.)

Completed since last report, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Willoh's Dagmar	551 C.S.H.B.	26·12·18	273	10½	4,489	5·55	249·54	200	284½
Wynda Wildflower ..	Not yet allotted	14·1·19	273	11	4,904	5·51	270·34	175	308¼
Jubilee Hydrangea ..	„	19·3·19	273	11½	3,716	4·89	181·70	175	207¼

C. J. REID, Devenish. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Chevy VI. of Melrose ..	3635	12·3·19	273	18½	6,598	4·14	273·07	250	311¼

Miss S. L. ROBINSON, Malvern. (Jersey.)

Completed since last report, 4. Certificated, 4.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Kyora's Defender's Claribelle II.	Not yet allotted	27·1·19	273	12½	4,388	5·03	220·59	175	251½
Pilbara of Kyora	6221	28·1·19	262	4	5,188	6·07	315·25	200	359½
Puen Buen Velvet VII. ..	3073	29·1·19	273	12	5,443	4·69	255·00	250	290¾
Bonnie Doon's Pride ..	Not yet allotted	20·3·19	273	9	4,291	5·91	253·53	175	289

G. ROWE, Kardella. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Rose	509 C.S.H.B.	31·12·18	273	8	5,692	4·63	263·71	250	300½

SADLER BROS., Noorat. (Ayrshire.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Ruthven of Yalart ..	5849	18·3·19	253	7½	6,461	3·91	252·74	200	288

AGRICULTURAL HIGH SCHOOL, Sale. (Ayrshire.)

Completed since last report, 3. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Madeira Flinders ..	1740	30·12·18	273	20	8,391	3·99	334·65	250	381½
Young Madeira of Latrobe ..	4814	8·2·19	273	13	5,482	4·10	225·03	175	256½

A. H. SCHIER, Caldermeade. (Ayrshire.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Phyllis ..	4639	15·1·19	273	12	4,615	4·38	202·09	175	230½

A. E. SPIERS, Nalangil. (Ayrshire.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Molly V. of Ayrshire Bank ..	5971	18·1·19	273	37½	10,055	3·51	353·28	250	401½

O. J. SYME, Macedon. (Friesian.)

Completed since last report, 5. Certificated, 5.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Queen of Friesland Park ..	Not yet allotted	10·1·19	273	31	11,351	3·52	400·20	250	456¼
Domino's Hergerveld Belle	"	21·1·19	273	25	10,195	3·90	397·94	250	453¾
Princess Ena	"	23·1·19	273	30½	11,448	3·86	441·88	250	503¾
Bolobek Jean	"	9·3·19	273	23	9,338	3·84	358·52	200	408¾
Duchess of Friesland Park ..	"	10·3·19	273	24½	10,045	3·57	358·89	250	409

G. H. WINDSOR, Pakenham. (Jersey.)

Completed since last report, 1. Certificated, Nil.

W. WOODMASON, Malvern. (Jersey.)

Completed since last report, 4. Certificated, 4.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Quality VI. of Melrose ..	3674	28·1·19	273	31	10,004	4·90	489·99	250	558¾
Pearl II. of Melrose ..	3670	6·2·19	273	12¼	4,623	5·42	250·83	250	286
Lady Elector III. of Melrose	5549	18·2·19	273	17¼	6,437	6·27	403·85	250	460¼
Fuchsia X. of Melrose ..	4516	19·2·19	273	23	10,230	4·12	422·18	250	481¼

SOME FRENCH SWEET WINES.

By F. de Castella, Government Viticulturist.

(Continued from page 111.)

The Rancio Wines of Rousillon.

Only in the extreme south of France are wines produced in any way similar to the Ports of the Alto Douro (Portugal). The district which has specialized in this type is a small one, constituting the extreme south east corner of the ancient province of Rousillon, the boundaries of which differ little from those of the modern Department of Pyrénées Orientales (Capital Perpignan). Though resembling Port in some respects, these wines differ considerably in their lower alcoholic strength. The sweet rancio wines of Rousillon contain, as a rule, 26 per cent. of proof spirit, as against 37 per cent. and even 40 per cent for true Ports.

Rousillon is a most picturesque and romantic part of France, especially the portion near the coast traversed by the railway from Spain, which is the region producing the special wines under review. Shortly after entering France at the frontier station of Culera-Cerbère, one passes the three railway stations of Banyuls, Port-Vendres, and Collioure, names well known in French wine circles, especially Banyuls and Collioure, which stand for the best and most typical rancio wines produced in France. The train passes through many tunnels, between which one gets glimpses of steep hillsides terraced with vineyards or clothed with cork oak and pine forests, with here and there a massive tower, a relic of bygone heroic days when the Rousillon, like other frontier districts was the scene of many wars.

Here on the lower slopes of the Pyrenees, quite close to the point where the Franco-Spanish frontier runs into the Mediterranean, climate and soil conditions—with the exception of the proximity to the sea—differ but little from those at Rutherglen. Rousillon is about the warmest part of France, and the Pyrenees, like our Australian Alps, are mainly of primary geologic age. The foothills in this neighbourhood are not unlike the lower ranges in many parts of North-East Victoria.

The wines for which Banyuls and Collioure ars so well known constitute a type different to anything else produced in France. Wines which differ a good deal in colour, sweetness and also in alcoholic strength, but which belong to the distinct class known in France and Spain as "Rancio."

This term is defined in the dictionary of Larousse as "a Spanish wine which has become yellowish with age," in other words—a tawny wine—not only has the colour changed, but bouquet and flavor are also considerably modified, having taken on a peculiar "nuttiness," due to oxidation and reminding of both Port and Madeira—in fact what we would call a "Porty" character.

The rancio development is undoubtedly an oxidation phenomenon, akin to *casse and maderisation*, which are defects in dry table wines; it is probable that a soluble ferment or enzyme, similar to oxydase, which causes casse, is responsible for the transformation. It seems to

be quite independent of the growth of any micro-organism, thus differing radically from the "Fino" character of Sherry, due to the growth, on the ullaged surface of the wine, of the "Flor" fungus, closely allied to mycoderma vini. Nevertheless, the cask in which the wine is stored seems to have much influence; a young wine placed in a cask which has previously contained rancios, develops this character much more rapidly than it otherwise would. For this reason the wine-growers of the region jealously guard their old casks, which, from father to son, have been used for the storing and ripening of these wines.

Wines made from the Grenache grape, grown on primary schistose and slaty soils, rapidly become rancio. Indeed this remarkable variety seems largely responsible for this peculiarity, especially on the slopes of the Pyrenees, both on the French and the Spanish sides. It is worthy of note that the Ports of the Alto Douro are also grown on primary schistose soils, though the grapes which yield them are altogether distinct from Grenache. *Bastard*, one of the chief Port varieties, shows a similar instability of colour.

Grenache does not always produce such wines; when grown on limestone formations of tertiary age so common further east—near Montpellier, for example—it yields wines of ordinary dry red type. Even here, however, its colour is less stable than that of most other red grapes. It is only when planted on primary schists and slates that the rancio character becomes fully developed, a remarkable example of the co-operation of the two factors, variety and soil, in influencing the type of wine produced.

The neighbouring Priorato district of Spain* has long been celebrated for its rancio wines; wines very similar to those of Rousillon, which is scarcely surprising, seeing that they were almost exclusively made from Grenache, or Garnacho, as it is known in Spanish, grown on soils of exactly similar geological formation.

It is to be regretted that the ancient reputation of the Priorato Rancios is largely a thing of the past, since certain merchants found it more profitable to blend the pure Grenache wines grown on the slaty hills with the more neutral produce of neighbouring districts. The resulting blends are largely shipped to England, formerly under the once familiar name of "Tarragona Port," a misuse of a regional term, which international legislation no longer tolerates.

Large quantities of blended Priorato are also shipped to South America under the name of *Priorato de mesa*, a lighter and drier wine than that in demand in England, and not fortified to any extent. These wines possess a somewhat attenuated rancio character.

Transplanted from its native Rousillon and Priorato to Victoria, Grenache retains its striking characteristics. The hillsides of Rutherglen, of identical geological formation to the foothills of the Pyrénées suit it admirably; when vintaged on the over-ripe side, and its sweetness retained by fortification, it develops a tawny colour and a rancio taste, the characteristics so desirable in a sweet wine, to a greater extent and in a shorter time than almost any other grape. A sweet Grenache shows as much quality and age at two years as a Syra (Shiraz) made under similar conditions would at four or five years.

* See Journal, 10th May, 1919, p. 314.

In France and Spain several sub-varieties of Grenache are grown. In addition to the typical black variety, the only one as yet introduced into Victoria, there is a red or grizzly form, known in French as *Grenache Gris*, and in the Rousillon patois as *Lladounet*. There is also a white Grenache. These are only colour variations of the well known black Grenache, which is by far the most important.

Semichon (*Ampelographie*, Vol. VI., p. 285) shows how Grenache enters into the composition of several quite distinct wines. In addition to the sweet wines under review—

This variety is grown in many vineyards yielding choicer wines (than vin ordinaire). Gathered at normal maturity (11 deg. to 13 deg. B.) it communicates to the wine its characteristic refinement and smoothness. Wine made from Grenache alone ages too rapidly, developing the rancio taste, which is as disagreeable in ordinary dry, red wines as it is desirable in a liqueur wine. The colouring matter becomes oxodized and is precipitated, the wine turning to an amber, Madeira-like tint. At Corbières* the recognised proportion used to be one-fifth Grenache to four-fifths Carignane. The roundness, smoothness, and refinement of the first, correcting the harshness of the second without the proportion of Grenache being sufficient to cause the wine to age too rapidly.

Grenache also yields full-bodied, blending wines, rich in colour and more or less fruity. These are grown on poor land and vintaged at 13 deg. to 15 deg. B. By this time the colour has greatly increased, and the partial mortification of the skins facilitates its diffusion in the fermenting vat. The resulting wines, rich in colour and often rather fruity, are much sought after by the trade for blending purposes. It has been erroneously stated that such wines are made from a mixture of Grenache and Carignane. Far more esteemed are the pure Grenache wines made under these special conditions, which, owing to their colour, alcoholic strength, body, and constitution, are much superior to wines made from Carignane. Vintage is as late as October (April here), fermentation taking place in casks not exceeding 1,300 to 1,700 gallons.†

When the muste registers as high as 18 deg. or 20 deg. B. the wine retains a few degrees of sweetness and ferments again in the spring. Purchasers from afar take advantage of the cold weather during January (mid-winter in Europe) to transport them.

But it is for the production of wines of rancio type that Grenache is most particularly adapted. Sometimes a small proportion of Carignane—a tenth, rarely a fifth, of the weight of Grenache—is blended in, but the latter is always the dominant variety, and the best wines are made from it alone.

These wines are of several distinct types, as will be seen from the analyses quoted below. The method of making the wine naturally varies according to the type required. The district certainly owes its reputation to the true Rancios, similar to old Spanish Priorato, usually of light, tawny colour, and varying from an almost dry wine, reminding of a brown Sherry or Madeira, to a distinctly sweet wine. These are highly esteemed as dessert or liqueur wines.

Within the past thirty years a demand has arisen for wines of darker colour, and a considerable proportion of the wine of the region is now made accordingly, being utilized for the manufacture of various medicinal and tonic wines, known variously as *vin de Quinquina* (a sort of red quinine wine) and as apéritifs or appetizers, a glass being taken before lunch or dinner, just as Vermouth is. Many proprietary brands, widely advertised in France under such well known names as

* Corbières produces a well-known red wine of Southern France, full bodied and dry, not unlike the Australian wines shipped to London.

† Very large fermenting vessels are the rule in Southern France. Storage casks of a capacity of up to 7,000 or 8,000 gallons and provided with a manhole in the upper part, to permit the entry of the crushed grapes, are commonly used instead of fermenting vats. After vintage they serve as storage casks.

Byrrh, Amer Picon, &c., have, as a foundation, the wines of Banyuls and Collioure.

The old-style Rancios are usually fermented apart from the skins, whilst in the case of the darker coloured wines fermentation with the skins is practised. Sometimes a highly coloured extract is made by treating the pressed skins with spirit and adding this to the new wine previously extracted from them.

According to Feret*—

The wines of Banyuls-sur-mer are in great demand as tonic wines and employed for the preparation of Vins de Quinquina. With age they become rancio and constitute choice dessert wines.

They are made from Grenache, either alone or mixed with a little Carignane. The grapes are pressed immediately after gathering, and the juice fortified by the addition of 2½ degrees of spirit. (These are French degrees. This would correspond to the addition of 2¾ gallons of 60 over proof spirit to each 100 gallons of must.) It is immediately placed in casks, without preliminary vatting. The liquid gradually clears and becomes fit for consumption. Formerly the grapes were vatted or fermented on the skins, and the alcoholic strength raised to 18 deg. (31.4 per cent. proof) by a small addition of spirit.

Coste Floret† describes a somewhat different method—

The wines of Banyuls are made from the Grenache variety, also known as Alicante.

The grapes are gathered past complete maturity and pressed immediately after stemming and crushing.

In order to dissolve the colouring matter of the grape, the marc, after removal from the press, is macerated with 90 per cent. alcohol (57.8 over proof) at the rate of 15 or 20 litres for each 100 litres of must extracted. This pasty mass is then pressed in order to separate the maceration products, which are equally distributed among the casks holding the must obtained from the first pressing.‡

The following abridged extracts from an article by L. Semichon, on the Vineyards of Banyuls§ relate to the making of the wine:—

Vintage is postponed until the grapes are overripe, yielding musts registering 18 degs. and 20 degs. B., fortification is practised, spirit being added either to the must or to the crushed grapes, fermentation develops and follows its course slowly, lasting for months, sometimes even for years. These wines long retain much of the sugary sweetness of the grape: after three years of careful handling they become marketable.

Thus are obtained natural sweet wines of high repute, known by such names as Grenache doux (sweet), Rancio, and Banyuls. If fermented separately from stalks and skins the wines are of a rosy colour, which turns to a flaxen russet (*roux blond*), tawny and yet golden, which, according to Bertal "seem to contain in them the sun which gave them birth."

If fermented on the skins, Banyuls or red Grenache is obtained: a highly coloured wine, which with age develops ruddy, brown tints (des reflets mordores), which is at the same time sweet and full-bodied, strong and yet delicately perfumed.

From the article by L. Semichon, on Grenache, in *Ampelographie* (Vol. VI., p. 285) the following additional particulars are taken:—

Grenache is, above all, renowned for the manufacture of liqueur wines. Over-ripeness is the rule, the grapes being allowed to shrivel. The must

* *Dictionnaire-Manuel du Négociant en Vins et Spiritueux et du Maître de Chai* (1896 edition), p. 513.

† Procédés Modernes de Vinification (1894), p. 292.

‡ Some years ago the writer prepared an extract such as that described by Coste Floret. It was made from marc pressed from over-ripe Syra (Shiraz) grapes when fermentation was about two-thirds completed. The strength was about 30 under proof (40 per cent. alcohol by volume). The bulk of the quantity made was immediately added to the wine, with satisfactory results. About 50 gallons was kept for a couple of years, by which time it had developed into a liquid of quite remarkable but yet delicate character and very useful for blending with wines of port type. Owing to technical difficulties in connection with excise regulations further experimentation on these lines was discontinued.

§ *Revue de Viticulture*, 19th April, 1906.

registers 18 degs. and 20 degs B., and scarcely .5 to .6 of total acid expressed as tartaric.

Pressed immediately and fermented apart from the skins, rose coloured wines are obtained, which retain little or no sweetness, and which "age" rapidly. These wines are kept in small oak casks which, from father to son, are used to contain the rancio. After two years the wine has developed this character, but it improves much by long storage in ullaged casks; it then becomes very aromatic (savoureux) owing to the amalgamation of the spirit and the rancio taste.

By fermenting the must after it has been fortified with 5 to 8 per cent. of neutral spirit of 86 degs. to 96 degs. (equivalent to the addition of 5½ to 8¾ gallons of 60 over proof spirit to each 100 gallons of must) Grenache doux (sweet Grenache) is obtained, a wine which is less *madérisé* and not so yellow as the above. Fermentation ceases whilst the gravity is still as high as 4 degs. or 5 degs. B. The wine is racked in winter in order to avoid, in the greatest measure possible, secondary spring fermentations. Such, nevertheless, usually develop to a varying extent, and these wines ferment very gently and for a long time. This type is nearly always of cleaner taste than blending wines (see p. 172), cleaner than the dry Rancios, and cleaner even than the Banyule type. No doubt, owing to the action of the spirit, which plays the part of an antiseptic, bringing about, from the commencement of the fermentation, a selection of yeasts.

Finally, if shrivelled Grenache grapes are fermented on the skins with the addition, immediately after crushing, of only 2 degs. to 4 degs. of spirit (2¼ to 4½ gallons of 60 over proof spirit to each 100 gallons) true Banyuls is obtained; a very fruity wine (vin liquoreux), sweet, and at the same time alcoholic, possessing much colour, which, however, turns brown fairly rapidly with age. These wines, which are greatly esteemed, resemble Tinta de Rota.§ During fermentation high temperatures must be avoided, as they result, more often than is realized, in the wine becoming sweet-acid and mannitic.

Gravities of musts of different vintages gathered in several localities of the region are listed, varying from 13½ degs. B. to 16½ degs. B., the average being 15½.

Analyses follow of three Grenache wines of distinct types. Nos. I. and II. are unfortified, natural wines, whilst No. III. is a typical sweet Banyuls, made by fortifying Grenache must to the extent of 6 degs. or 8 degs. of spirit (6½ to 8¾ gallons 60 over proof spirit per 100 gallons).

No. I still retains some of the original sweetness of the grape, whilst No. II is practically dry.

—	No. I. Sweet Grenache, natural fermentation.	No. II. Dry Grenache, natural fermentation.	No. III. Sweet Grenache, fortified.
Proof Spirit .. .. .. per cent.	26·2	26·2	2·8
Sugar as Glucose .. .. ,,	4·38	·15	13·2
Total acid grammes per litre (as sulphuric)	4·5	4·6	3·9
Volatili ,, ,, ,,	·89	·85	·45
Glycerine .. .. grammes per litre	11·2	10·4	14·1
Sulphate of Potash .. ,, ,,	·49	1·09	·33
Ash .. .. .. ,, ,,	2·32	3·82	2·33

§ The well-known wine of Southern Spain known in England as Rota Tent.

ANALYSIS OF TWO ROUSILLON WINES COLLECTED BY THE WRITER IN 1908.

	Banyuls, 1907 Vintage.	Collioure, 1906 Vintage.
Alcohol as proof spirit .. .. per cent.	25·95	26·45
Total sugar (after inversion) .. .. "	8·59	6·92
Sugar free extract .. .. "	2·33	2·40
Sulphates (as K_2SO_4) .. .. .. grammes per litre	·36	·49
Acidity—Total, as tartaric .. .. .. " "	3·8	4·4
" Volatile as acetic .. .. .. " "	·6	1·1
Total SO_2 .. .. mgrams "	6·	6·
Free SO_2 .. .. " "	3·	3·

From the foregoing, it will be seen that French rancio wines are made from over-ripe Grenache grapes grown on primary slate and schist formations. Fortification, if practised at all, consists in the addition of spirit at the commencement, and not at the close of, fermentation. These wines retain considerable sweetness, notwithstanding their comparatively low alcohol strength, which is usually in the neighbourhood of 26 per cent. proof.

(*To be continued.*)

CANADIAN WONDER BEANS.

By Temple A. J. Smith, Tobacco Expert.

This is a crop which has considerable possibilities in Victoria, but so far it has been confined to a very few localities, chiefly in the Orbost and North-Eastern Gippsland districts. There are many other parts of Victoria which should produce good crops, and probably only the introduction of the idea and a description of the climates, soils, and methods of cultivation and management may lead to the extension of the industry.

In America the production of the bean crop reaches large proportions, and proves highly profitable to the growers. In the United States an area of over 800,000 acres is planted, the yield being 11,250,000 bushels of 60 lbs. per bushel—an average of 14 bushels per acre, and in Canada 50,000 acres gave 1,000,000 bushels, or an average of 20 bushels. These yields are low as compared with Victorian returns, crops at Orbost yielding up to 60 bushels per acre. No average can be

given, as a record has not been kept of the returns from this particular crop, but statistics for all beans grown in the State are given as 1,377 acres, yielding an average of 13 bushels per acre. When it is remembered that this includes garden and other beans, it will be understood that the average yield of Canadian beans is much higher, as they are heavy yielders as compared with others.

Prices recently have been high, reaching 50s. per bushel, owing to scarcity of the supply; but previous prices ranged from 11s. to 25s. per bushel. The crop, therefore, should be a very remunerative one, provided it is grown under suitable conditions.

The bean crop requires a cool and moist climate, with freedom from frost during the growing period, and with sufficient summer showers to keep the crop growing. Such climates are to be found along the foothills of the Dividing Range and the coastal districts of North-Eastern Gippsland.

Soils suitable are good alluvial river flats containing lime and of a loamy nature; silty soils with a good supply of organic matter will also produce good crops. Efficient drainage is essential in all cases. As a general guide it may be said that almost any soil and climate that will produce good maize will produce beans.

Manures are not used to any extent at present in Victoria, but there can be no doubt, on the lighter soils, that decomposed farm manure would be advantageous, and, where soils are deficient in lime, dressings of gypsum or ground limestone, at the rate of from half to one ton per acre, would give good results. Sulphate of potash and superphosphate, at the rate of 1 cwt. each, would also add to the yield on soils requiring them. Lime and manure should be applied three weeks before planting.

The time to plant beans depends upon the district. They should not be planted until all danger of frost is past, as the young plants are very tender. Generally speaking, the end of October or early November is best; later sowings often give good returns.

About 1½ bushels will plant an acre. The seed should not be put in too deeply; from 1 inch to 2 inches is as far as it should be down. The stiffer the soil, the shallower the depth to sow. The beans should be sown in rows from 24 to 26 inches apart, with from 5 to 6 inches in the drills.

In order to keep the land free of weeds, the horse-hoe should be used between the rows to keep the soil worked and weeds down, until the plants are too large to permit of a horse working between the drills, after which hand hoes are required. It is very necessary to keep the crop clean, as the presence of weeds at harvest time will complicate the drying process, and cause loss and extra work. Weeds will also have the effect of considerably reducing the yield of the crop.

Good cultivation is very necessary for beans, and the soil must be brought into fine and clean condition before planting. A fallow at least three months or more before the planting season will always be of benefit. This will have the effect of sweetening the land, and give all vegetation time to rot down thoroughly. Undecomposed vegetable matter will hinder seed sowing, and harbor insect pests. The ploughing should be deep; the first time, say 7 or 8 inches. Subsequent cultivation

is best accomplished by scarifiers or other tined implements, which should be used every time weeds appear. If a second ploughing is found necessary to cover weeds, it should be shallow, say 3 inches, as it is a mistake to turn up the cold soil from underneath just before seeding. The object of the cultivator should be to obtain a fine, firm, and clean seed bed in warm, moist condition. Much labour in hoeing and weeding will be saved later on if this is attended to.

Harvesting is done in March and April, when the pods dry off. The plants are pulled by hand, each man taking two rows at a time, and stooking the plants roots uppermost along the rows, and each stooking his plants on the same row. This is done to leave room for the drays to pass between the rows when carting in. The crop is usually left two to three days to dry; if the weather is moist, a longer time must be allowed. When dry enough, the crop is carted in and threshed.

In carting forks must not be used in lifting, the work being all done by hand, and the plants thrown on to the dray. Forks cause the beans to shell.

Threshing is done on cloths made of hessian, 25 yards long by 18 feet wide. Two of these cloths are set side by side, and pegged down. The dray drives up the centre, and the load is thrown off on both sides, making two rows for threshing. The dray should never go over the beans, a clear passage being kept for it in the centre.

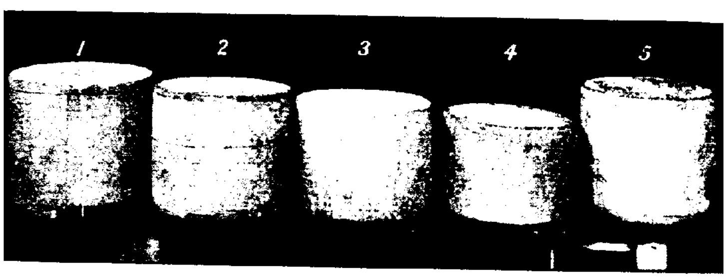
Threshing is done with a two-horse roller, which goes around and over the two rows of beans. During this process the beans are kept stirred up with poles, so that they do not set down too hard. Forks should not be used for this purpose, as they destroy the cloths. If the beans are tough, and do not thresh well, flails can be used to finish, but this is not always desirable, as flailing brings out the soft beans, which, later on, have to be picked out of the bulk. When all the beans are threshed out, the straw is shaken up, and tossed aside, leaving the threshed beans and chaff on the cloth. A new load is put on top of this, and the threshing process repeated. Towards the end of the day the threshed beans are bagged and winnowed. Some growers winnow right off the cloth, others prefer to leave the beans in the chaff for a time; the latter is a good plan if they are quite dry. If, however, the chaff is at all damp the seed is liable to mildew, and this condition must be avoided. After winnowing, the beans are hand-sorted, and all discoloured, flat, or other inferior ones are discarded. They are then bagged ready for market.

Orbost beans are sold largely for seed, and are an especially good sample, being of good size and colour. Special care must be observed to keep the beans reserved for seed stored in a dry place, as any mildew, to which they are readily liable, injures their germination and value.

SHOULD MILK FOR CHEESE MAKING BE PAID FOR ACCORDING TO ITS FAT CONTENT?

By R. T. Archer, Senior Dairy Inspector, and G. C. Sawers, Cheese Expert.

In order to demonstrate that milk for cheese-making should be paid for according to the quality indicated by the Babcock tester, certain experiments were recently made. In each of the five cases, of which particulars are given hereunder, 500 lbs. of milk was made into cheese. To obtain milk giving the wide variation in fat contents required for the test, that of different breeds of cattle was used, so that no addition or subtraction of fat would be necessary. No effort was made to ascertain which breed yielded the best milk for cheese-making, the object of the experiments being simply to show that milk ought to be paid for according to its quality. The following are the results obtained in the five tests carried out:—



—	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Weight of milk, lbs. ..	500	500	500	500	500
Percentage of fat ..	5·1%	4·3%	4·1%	3·45%	5·2%
Weight of cheese, lbs. ..	57	53¼	51¼	43	61
Value of cheese at 1s. per lb.	57/-	53/3	51/3	43/-	61/-
Value of milk per gallon ..	13½d.	12¾d.	12¼d.	10¼d.	14½d.
500 lbs. of milk at 1s. 6d. per lb., butter-fat	38/3	32/3	30/9	25/10½	39/-
Total solids	13·63%	13·52%	13·26%	11·62%	14·54%
Solids not fat	8·53	9·22	9·16	8·17	9·34
Ash	·68	·70	·72	·66	.74
Specific gravity	1·031	1·032	1.033	1·0303	1·033
Amount of fat in the milk..	25·5 lb.	21·5 lb.	20·5 lb.	17·25 lb.	26·0 lb.
Amount of fat in cheese ..	23·3 lb.	18·22 lb.	16·6 lb.	16·52 lb.	23·14 lb.
Amount of fat lost ..	2·2 lb.	3·28 lb.	3·9 lb.	0·73 lb.	2·86 lb.
Percentage of fat lost ..	8·62%	15·25%	19·0%	4·23%	11·0%
New cheese, per lb. of fat ..	2·44	2·79	2·73	2·73	2·42
Matured cheese, per lb. of fat	2·23	2·47	2·5	2·49	2·35
Pounds of milk to a pound of cheese	8·77	9·38	9·75	11·6	8·2
Pounds of cheese to a gallon of milk ..	1·14	1·065	1·025	.86	1·22

If a milk is rich in fat it is also rich in other solids, and it is the solids in the milk (not the water) that represents the food value. Those cows, however, which gave milk of comparatively low fat test usually give a greater quantity, in this way compensating for the small fat content.

It is only equitable then that the milk should be paid for according to its quality. While the butter-fat test does not determine its actual value, payment on that basis is very much fairer than payment by the gallon irrespective of its solid contents.

For cheese-making the fat and casein test gives the actual value. This test can be simply made; but, unfortunately, a section of the dairy farmers have not yet come to recognise that even the butter-fat test is a necessary step. For instance, the milk from which the cheese in No. 5 was made yielded 18s. worth more cheese than that of No. 4. This made the milk of No. 5 worth 1¼d. per gallon more valuable than No. 4.

The butter-fat contained in the milk of No. 5 was 26 lbs., which, at 2s. 4d. per lb., would have given, approximately, 61s.—the value of the cheese made from it. No. 4 would have yielded 17¼ lbs. fat, and this at 2s. 4d. per lb. would have given 40s. 3d., while the cheese was worth 43s. On a butter-fat basis at 1s. 6d. per lb., the milk of No. 5 would have been worth 13s. 1½d. more than that of No. 4, not taking into consideration that it was richer, containing 1.17 per cent. more non-fatty solids and 2.92 per cent. more total solids.

For condensing it is understood that in milk-testing more than 3.3 per cent. fat is not required, and some condenseries will not pay any more for milk containing a higher percentage. If this be so, milk similar to that used in No. 5 might be reduced to that standard by separating sufficient to yield 9½ lbs. butter-fat, which, at 1s. 6d. per lb., would be worth 14s. 3d., and still be the better milk for condensing owing to its excess of solids, as the more solids there are in milk the more condensed milk will it yield. The largest milk condensing company in the world recognises this, and pays, approximately, on the following scale:—

FOR MILK TESTING.

Per gallon of 10 lb.

3·3 per cent.	3·5 per cent.	4 per cent.	4·5 per cent.	5 per cent.
7d.	7·3d.	8d.	8·8d.	9·5d.

The same principle applies in the case of milk required for milk powder; and, in New Zealand, where this business is developing rapidly, there is a movement on foot to arrange for the purchase of milk on its total solid contents as estimated by the fat test and specific gravity according to Richmond's formula, thus recognising that the richer the milk the more valuable it is.

STANDARDIZED PACKING AND GRADING OF FRUIT.

By Ernest Meeking, Senior Fruit Inspector.

(Continued from Vol. XVI., Page 746.)

Fruit Act, 1917, Part II., and Regulations.

Though assented to on 22nd October, 1917, the Victorian Fruit Act did not come into operation until 17th May, 1918, the date on which the Regulations under the Act were proclaimed.

That portion dealing with the packing, grading, and marketing of fruit was framed on somewhat similar lines to the Fruit Marketing Act of Canada, yet it differs from the Canadian legislation in many respects, chiefly in the direction of providing that the sale of fruit in open cases (that is, cases with the lid or side removed), or on street barrows, or in retail shops, may be regulated by prescribing that such fruits shall be graded and marked accordingly.

So far, the Regulations have been made to apply only to fruits sold in cases, whether the cases are closed or the fruit is exposed for sale with the lid or side removed. The provisions in connexion with the closed cases are much more stringent than those which apply to fruit sold in open cases. Potatoes and onions are also included, and grade standards are established for these. This, however, does not concern the subject-matter of this article.

The following is a short digest of the Regulations, so far as these apply to the sale of fruit:—

DEFINITIONS.

In the definitions, "Advertising Matter" means any paper, card, slip, or anything inserted into any package of fruit or vegetables, and which bears any written or printed statement used for the purpose of advertising.

"Falsely packed" means packed in any other way than is prescribed.

"False Mark" means any marking or description which, by reason of anything contained therein or omitted therefrom is likely to mislead in a material respect as regards the grade, weight, or variety of any fruit or vegetables, or the description, kind, capacity, materials, dimensions, measurements or conditions of any package to which it is applied, and includes every alteration of any mark or description, whether by way of addition or effacement or otherwise, which makes the marking false or likely to mislead in a material respect.

"Foreign Substances" means any earthy matter, stones, sand, or gravel.

"Fruit" means any fruit declared by the Governor in Council by notice in the *Government Gazette* to be fruit for the purposes of these Regulations.

"Grade" shall have relation to colour, maturity, number, size, variety, and soundness, and graded and grading shall have a similar meaning.

"Marks," in relation to fruit or vegetables or packages, means any description, information, statement, words, or marks, or any suggestion direct or indirect—

(*a*) as to the colour, kind, number, size, soundness, variety or weight of fruit or vegetables, and the capacity, dimensions, or measurements of packages—

(*b*) as to the place or locality in or at which the fruit or vegetables were produced or packed or the packages were made—

(*c*) as to the name, address, and guarantee of the manufacturer of the package or the name and address of the purchaser of the fruit or vegetables or the person by whom they were selected, packed, or in any way prepared for market—

(*d*) and includes any mark which, according to the custom of the trade or of common repute is taken to be an indication of the above matters, and "marked" shall have a similar meaning.

"Packed" means packed as prescribed.

"Packing Material" means strawboard, wood-wool, wrapping paper, or other material used in packing fruit or vegetables.

"Prescribed" means prescribed by these Regulations.

"Registered Brand" means any brand which has been registered with the Department of Agriculture in pursuance of these Regulations.

"Sound" and "Soundness" means freedom from damage or decay and from any abnormal condition of or in fruit or vegetables, whether consisting of the presence of or caused by or due to the operations, development, growth, or decay of any insect or fungus.

"Size" in relation to fruit means the diameter or size of any fruit measured from side to side at right angles to the axis of the stem and the calyx or apex.

"Standards" means the standards set out in these Regulations.

"Vegetables" means any vegetables declared by the Governor in Council by notice in the *Government Gazette* to be vegetables for the purposes of these Regulations.

The following fruit and vegetables have been declared fruit and vegetables within the meaning of the Act:—

FRUIT.

Apples	Gooseberries	Pears
Apricots	Grapes	Persimmons
Bananas	Loganberries	Pineapples
Blackberries	Loquats	Plums
Cape Gooseberries	Mangoes	Quinces
Cherries	Nectarines	Raspberries
Citrus Fruits	Passion Fruit	Strawberries
Currants	Peaches	Tomatoes
Figs		

VEGETABLES.

Asparagus	Cauliflowers	Peas
Beans	Cucumbers	Potatoes
Beetroot	Lettuces	Tomatoes
Cabbages	Onions	Turnips
Carrots	Parsnips	

Packing, Grading, and Marking of Fruit and Vegetables.

The regulations regarding the packing, grading, and marketing of fruit and vegetables provide generally that the outer layers or shown surface of fruit or vegetables, whether packed in a case or sold loosely shall be so packed or arranged that they shall be a true indication of the average grade of the whole of the fruit or vegetables, the manner in which such fruit or vegetables are stacked, arranged, or packed, and the presence of any foreign substance. This Regulation, therefore, provides generally against the "topping" of any fruit or vegetables. In addition, apples, citrus fruits, peaches, and pears must be graded in four grades, viz., (*A*), (*B*), (*C*), or (*D*).

Grade *A* shall consist of well-grown specimens of one variety, sound, of uniform and of at least normal size, and of good colour for the variety, grade, or size, of normal shape, and properly packed.

Grade *B* shall consist of well-grown specimens of one variety, sound, of uniform and of not less than medium size, and of good colour for the variety, grade, and size of normal shape, and properly packed.

Grade *C* shall consist of specimens of uniform, and of not less than medium size for the variety and grade, sound, and properly packed.

Grade *D* shall consist of sound specimens, so packed that the outer layers or shown surface shall be a true indication of the average grade of the fruit throughout the package.

In addition to the above, additional requirements are provided for apples, so far as sizes and colour are concerned, as follows:—

GRADE A.

All apples in this grade shall consist of specimens of not less than 2½ inches in diameter, excepting that normally small varieties, such as Fameuse (Pomme de Neige), Yates, Summer Pearmain, &c., shall consist of specimens of not less than 2¼ inches in diameter.

Wholly red varieties, such as Baldwin, Black Ben Davis, Hoover, Jonathan, King David, &c., shall, when such varieties are not less than 2¾ inches in diameter, consist of at least 75 per cent. of specimens of good red colour for the variety, and if less than 2¾ inches in diameter shall consist of at least 90 per cent. of specimens of good red colour for the variety.

Striped or partially red varieties, such as Cox's Orange Pippin, Delicious, Nickajack, Rome Beauty, &c., shall, when such varieties are not less than 2½ inches in diameter, consist of at least 50 per cent. of specimens of good red colour for the variety, and, if less than 2½ inches in diameter, shall consist of at least 75 per cent. of specimens of good red colour for the variety.

Yellow or green varieties, such as Cleopatra, Dumelow Seedling, London Pippin, or Newton Pippin, shall consist of specimens of characteristic colour for the variety.

GRADE B.

All apples in this grade shall consist of specimens of not less than 2¾ inches in diameter. Wholly red or striped or partially red varieties shall consist of at least 33⅓ per cent. of specimens of good red colour for the variety. Yellow or green varieties shall consist of specimens of characteristic colour for the variety.

Grade C.

All apples in this grade shall consist of specimens of not less than 2¼ inches in diameter. No colour requirements are needed for this grade, excepting that specimens shall not be clearly immature.

Grade D.

Apples in this grade must consist of specimens not less than 2 inches in diameter, and packed in accordance with the general requirements of these Regulations, viz.:—That the outer layers or shown surfaces of the fruit contained in the package shall be so packed that they shall be a true indication of the average grade of the whole of the fruit contained in such package.

No colour requirements are needed in this grade, excepting that specimens shall not be clearly immature.

Notwithstanding anything to the contrary, normally small varieties, such as Fameuse (Pomme de Neige), Yates, Summer Pearmain, &c., shall be allowed in any grade if the specimens in such varieties are not less than the following diameters:—

1. Grade A.—2¼ inches.
2. Grade B.—2¼ inches.
3. Grade C.—2½ inches.
4. Grade D.—2 inches.

General Requirements of the Regulations.

These provide that—

(*a*) packages must be of the sizes shown in the Regulations—

(*b*) the proportion of foreign substances shall not exceed 2½ per cent., either by weight or measurement, of the total contents of a case, or 3⅓ per cent. of the total contents of any package—

(*c*) Packing materials shall not exceed the quantities sufficient to cover the top and bottom of the package of a combined thickness of 1½ inches, excepting in the case of grapes, when cork-dust may be used to the extent of 5 lbs. for each package—

(*d*) no more than two wrappers shall be used to wrap each fruit—

(*e*) advertising matter must be confined to one slip, label, or sheet of paper of a thickness not exceeding one-sixteenth of an inch, and of no greater size than is sufficient to cover the top of the fruit in any case or package—

(*f*) in the case of any fruit excepting apples, citrus fruits, peaches, or pears, which are provided for by grading, the net weight or number or quantity of the contents shall be marked on the outside of the package itself or on a docket, tag, or label in a conspicuous position on the outside of the package in letters of not less than ¼ inch in length—

(*g*) the name of the packer or grower must also be marked on the outside of the package in letters of not less than ½ inch in length. In the case of a firm, the name of the firm must be so shown—

(*h*) the name of the variety or varieties of the fruit must be shown on the package in letters not less than ¼ inch in length. In the case of apples, citrus fruits, peaches, or pears, the package must be marked with the grade letters A, B, C, D of not less than ¼ inch in length—

(*i*) the maker's guarantee must also be shown on packages within a space measuring not more than 3 inches long and 1½ inches wide, with the words, "Guaranteed by maker to contain one Imperial bushel," or "Guaranteed by maker to contain one-half Imperial bushel," or "Guaranteed by maker to contain one-quarter Imperial bushel," or, in the case of grapes, with the words, "Guaranteed by maker to contain 25 lbs. net," or "Guaranteed by maker to contain 28 lbs. net," as the size of the package warrants. Punnets and buckets for berry fruits must be marked with the words, "Guaranteed by maker to contain 1½ pints," or "Guaranteed by maker to contain two Imperial gallons"—

(*j*) all fruit packed for sale must be sound.

Exemptions.

Fruit or vegetables sold for manufacturing purposes shall be exempt if the packages are marked legibly with the words, "For factory use," and if the seller can satisfy an inspector that such fruit is for manufacturing purposes only.

Fruit sold in open packages, *i.e.*, with the lid or side removed need only be marked with the name or registered brand of the owner, and the maker's name and guarantee, and in the case of apples, apricots, citrus fruits, peaches, and pears the designation of the grade A, B, C, or D.

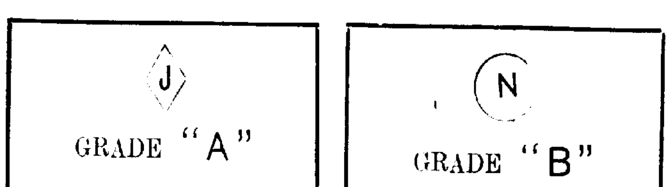
EXPLANATORY NOTES.

1. A mark made by a lead pencil will not be considered durable, but a clearly printed label firmly affixed to a package will be considered as such.

2. When the name of the variety is unknown or doubtful, the symbol "X" may be substituted for the variety name.

3. Slackly packed and over-pressed packages are to be considered improperly packed if the condition is likely to result in permanent damage to the fruit during transit or handling.

4. Concerning the marking of packages with the lid or the side removed, as required by Regulation IV. (3), the following styles of label, measuring 1 inch by 2 inches, and bearing the imprint of the owner's registered mark or brand and the designation of grade are suggested as an example.



Since the introduction of the Victorian regulations, Tasmania has adopted grading regulations with respect to apples and pears.

A digest of these will be given in next article, and also an outline of the standards adopted in some of the United States and the Dominion of Canada.

FARM NOTES FOR FEBRUARY.

STATE RESEARCH FARM, WERRIBEE.

H. C. Wilson, Manager.

Weather.

During the month the weather has been seasonable, 30 points of rain only having been recorded, making a total of 155 points for the year.

All natural pastures and stubble paddocks on the farm are particularly dry, and stock at present are depending to a large extent on the fodders grown under irrigated conditions, together with the dry feed of these stubble fields.

Good soaking rain in the district would materially benefit the stock outlook and replenish the water supply of the district, but such a fall would be more seasonable towards the end of the coming month.

Spring-Sown Rape as a Catch Crop.

Sixty acres of rape was sown in late September, 1919, on a fallow, which it is intended to crop this season with hay. Four pounds of Dwarf Essex Rape, with 56 lbs. superphosphate, was sown to the acre. The rain, which fell during November, gave the crop a good start, and during late December, January and February good sheep feed was secured from it. The total carrying capacity of the crop amounted to 600 sheep for five weeks, or, in other words, each acre carried the equivalent of one sheep for 50 weeks. Furthermore, being available in the dry months of the year, the fodder was not only fattening, but healthful. The sheep grazed on it gained considerably in condition, and an estimate of its grazing value has been put down at £1 per acre, with an initial outlay of 6s. 6d. for seed, manure and drilling. Past experience here has proved that a rape crop of this kind has rather a beneficial effect upon the soil, and the following main crop gives better results than if grown in the ordinary manner on bare fallow.

Preparation for Seeding, 1920.

On the dry farming lands of the farm, 650 acres were fallowed during the months from July to September of last year. These fallows have since been rolled, harrowed, and disc cultivated, and are now in good tilth awaiting further autumn rains, when they will be given the final cultivation before seeding.

During the month the following areas have been ploughed in preparation for various crops this winter:—60 acres for rape, 140 acres for barley, 200 part ploughed for oats.

The above areas, which have been green ploughed to carry winter crops of rape, barley and oats this season, were all fallowed in 1917, and carried crops of hay and wheat in 1919. The total cereal seeding this season will be (exclusive of experimental areas) 1,050 acres

Seasonable Activities During the Month of February.

Lucerne hay harvesting has received marked attention, some 150 tons of prime hay being stacked. The best fields have yielded up to

37 cwt. per acre in the single cutting, and the average for the season of 5 cwts. on such fields as these will amount of 7 tons. Generally throughout the district 5 to 5½ tons of good quality lucerne hay per acre may be estimated as an average yield. Irrigation activities have been carried on throughout the month, and, owing to the dry weather and the hot winds, which have prevailed, heavy waterings have been applied to the lucerne areas. To date for the season since 1st September, 1919, approximately 20 inches of water has been applied to all our irrigated areas, and it is estimated that one further watering of 4 inches per acre will complete the season. This will give a total of two acre-feet of irrigation water to every acre under the irrigation system of the farm.

Further activities, such as thrashing, straw baling, grain carting, chaff cutting, grading of seed wheat and despatch, destruction of noxious weeds, attention to dairy herd, sheep, cattle, horses and poultry, were carried out, as well as experimental work and general farming routine.

Fodder Reserves.—There has not been a more pressing problem facing the agriculturist and stock-owner for the past twelve months than the question of adequate fodder reserves. Conditions similar to those which prevail at present should teach those men dependent on the land for their living the great necessity to be ready for the dry times, which come periodically. No stock-owner should be without hay, or fodder of some kind, to carry his stock through a period of at least twelve months similar to that which we are at present undergoing. It is always false economy to sell this necessary reserve of fodder, even though the market price be tempting in the extreme. The holding of such reserves is the only real insurance against drought in the dry areas throughout the State.

At the present time, on this farm, 500 tons of wheaten and oaten hay, 225 tons of lucerne, 30 tons of baled oaten straw, and 160 tons of lucerne and oaten ensilage are on hand and are sufficient to carry the stock for at least 18 months from date in case of necessity.

Live Stock.

Horses.—Forty working horses are being continually employed at the seasonable cultural operations of the month, while 20 draught mares, with their foals by the Clydesdale stallion, Baron Wigton, are being grazed, and will be brought into work during April, when the heavy part of the seeding has commenced. The rations of the horses in full work at present is approximately 35 lbs. of oaten, lucerne, and wheaten hay chaff during working days—Monday to Saturday; while on Saturday afternoon and Sunday they are given lucerne hay in the shelter paddock, as well as chaff at night. No grain of any kind is now being fed, and it is maintained that the addition of lucerne to the ration of hay chaff makes up the necessary nutritive ratio so essential for the health and strength of these working horses.

Cattle.—Forty-four Red Poll cows are now being milked in the dairy, and six Friesians. These 50 cows are averaging approximately 150 gallons of milk per day. Their rations consist of 14 lbs. lucerne and oaten silage, together with 8 lbs. of bran per day in the bails, 12 lbs. lucerne hay in the feeding racks at night, and one hour per day grazing on irrigated lucerne. The health of the whole dairy herd

has been excellent during the month, and the cows are in good milking condition. There are on hand also 18 young and four aged bulls, together with 12 heifers and 10 dry cows.

Sheep.—The total number of sheep being carried at present on the farm consists of the following:—640 Merino-Lincoln cross four-year-old ewes in lamb to Suffolk and Border Leicester rams, to drop from 1st April onwards; 30 Suffolk cross weaners; 30 mixed sheep as rations; 260 Border Leicester studs; 80 Suffolk studs; total, 1,040. The best of the stud sheep are now being given special treatment, with a view to exhibition in the forthcoming July Sheep-breeders' Show. The bulk stud and crossbreds are acting as scavengers in the fallows, pasture areas, stubbles, and occasional green fodders. Their condition is being maintained for lambing. Although the Suffolk and Border Leicesters studs were mated in the early part of January of this year, we do not expect the lambs from these flocks to drop to due date, as it has always been difficult to have these English breeds served before the middle or the end of February each year.

Main Work Proposed for the Month of March.

1. Continuation of lucerne hay harvesting and irrigation.
2. Final cultivation of fallows and preparation for seeding.
3. Completion of ploughing for winter crops of barley and oats.
4. Seeding of rape—catch crop, 60 acres.
5. Start to be made at early seeding of barley as fodder.
6. Maintenance of farming routine and improvement work.
7. Attention to live stock and dairy herds.
8. Excavation of main drainage channel through low levels of farm.

EXPERIMENTAL WORK.

By G. S. Gordon, Field Officer, Werribee.

General.

The chief work on the experimental fields has been that of ploughing and fallow cultivation in preparation of the seed-bed for this year's crops. Other items were:—

1. Examining and arranging the seed from apparently successful crosses for sowing as first generation crosses in 1920.
2. Final laboratory examination of the F1 and F2 crossbred cereals and individually recording, thrashing and preparing the seed from the selected plants.
3. Thrashing, winnowing and weighing the grain from F3 and F4 crossbred cereal plots, tabulating the results and grading the seed of those selected for further trial in long rows.
4. Harvesting sugar-beet seed from selected roots having a high sugar content.
5. Investigation of soil and subsoil conditions affecting the growth of lucerne under irrigation.
6. Despatch of graded seed wheat to farmers.

Seeding Tests, 1919.

The importance of graded seed, early sowing and suitable variety as factors governing successful cereal culture is again emphasized in

the following tables giving the results of seeding tests carried out at Werribee during the past season:—

TABLE No. I.

GRADED SEED TESTS, 1919.

Seed (65 lbs. per acre) Sown with 120 lbs. super. per acre on well-worked fallow, 29th May, 1919. Harvested 31st December, 1919. Variety, Graham.

Grade of Seed.	Yield per acre.		Remarks.
	bush.	lbs.	
Normal seed (from harvester)	11	36	Average of 3 plots
First Grade	14	28	Average of 2 plots
Second Grade	12	44	" "
Third Grade	11	4	" "

NOTE.—The first grade of seed was retained by a screen having 2.75 m.m. openings. The second grade of seed was retained by a screen having 2.5 m.m. openings. The third grade of seed was that which passed through a screen having 2.5 m.m. openings.

TABLE No. II.

EARLY AND LATE SOWN VARIETY TESTS, 1919.

Seed 65 lbs. per acre, fertilized with 120 lbs. super. per acre. Sown on well-worked fallow in Field No. 3 N.E.

Variety.	Yield per acre.			
	Early Sown (28th May, 1919).		Late Sown (9th July, 1919).	
	bush.	lbs.	bush.	lbs.
Yandilla King	10	8	1	28
Marshall's No. 3	10	8	2	32
Federation	12	48	2	24
Dart's Imperial	15	12	3	40
Gluyas	13	4	3	28
King's Early	13	52	2	0

TABLE No. III.

EARLY AND LATE RATE OF SEEDING TEST WITH ALGERIAN OATS.

Sown on fallow in field No. 4 N.E. Fertilized with 120 lbs. super. per acre.

Seed per acre.	Yield per acre.			
	Early Sown (28th May 1919).		Late Sown (4th July 1919).	
	bush.	lbs.	bush.	lbs.
Algerian Oats, 80 lbs.	19	32	3	0
" " 60 "	17	24	3	0
" " 40 "	14	24	2	24

Permanent Rotation Field.

The results from the various wheat plots in this field are recorded in order of yield in Table No. IV. The three plots sown on bare fallow are all at the top of the list, and give an average yield of 21 bushels 3 lbs. per acre. The next group of five plots—four following peas harvested for grain and one following rape—give an average yield of 17 bushels 55 lbs., while the plot on which wheat is grown every year is at the bottom of the list with only 15 bushels 11 lbs. per acre.

TABLE No. IV.

PERMANENT ROTATION FIELD, 1919.

Yields from Wheat Plots.

Variety, Yandilla King. Seed per acre, 73 lbs. Sown 2nd June, 1919. Fertilizer—Super., 120 lbs. per acre. Plot area, 42 acres. Harvested 2nd January, 1920. Rainfall during growing period, 6 in.

Plot No.	Rotation.	Yield per acre.		Remarks.
		bush.	lbs.	
15	Oats, Pastures, Fallows, Wheat	21	59	
25	Bare Fallow, Wheat ..	20	38	
20	Pasture, Fallow, Wheat ..	20	33	
32	Oaten Hay, Peas, Wheat ..	19	7	
35	Oaten Hay, Rape, Wheat ..	18	58	Outside plot, damaged by birds. Yield, including estimated loss
29	Barley, Peas, Wheat ..	18	20	
23	Rape, Peas, Wheat ..	17	41	
11	Rape, Barley, Peas, Wheat ..	15	33	
26	Wheat continuously ..	15	11	Plot containing a lot of wild oats

RUTHERGLEN EXPERIMENT FARM.

P. B. O'Keefe, Manager.

The rainfall for the month was nil, and heavy winds and dust storms were of frequent occurrence. Notwithstanding the dry conditions prevailing ploughing was carried on, and all areas, except those intended for late sowing with brown oats, barley, and peas, are nearing completion.

The distribution of seed grain has commenced, both wheat and oats being eagerly sought after. In the case of wheat the orders were so numerous that it was found necessary to limit parcels so as to insure all farmers securing at least a proportion of the amount required, thus at least putting them in the way of having a supply of pure seed for their own use next season.

CULTURAL OPERATIONS.

The total area now ploughed exclusive of Experiment Field is 500 acres, 200 acres of this being fallow which has been doubly cultivated with spring tooth-cultivator; the remaining 300 acres is now being

rolled and worked up in preparation for seeding early in April. A further area of 80 acres will be ploughed later and seeded with brown oats 40 acres, barley 20 acres, and peas 20 acres.

LIVE STOCK.

Live stock are holding their condition well, but food supplies are now becoming scarce, stubble growth and summer grasses having quite dried up.

Two cows both by Ayrshire bull have come in, one a heifer, the other on her second calf. The former shows a test of 4.4, the other 4.6. The best yield for the month was a shorthorn cross cow which calved during January; she yielded 850 lbs. milk with a 4.3 test. Produce to the value of £1 8s. per cow was sold. Fodder consists of soaked wheaten chaff and bran, sorghum, silage, and paddock pasture. Young stock are given a small daily ration, chiefly waste from cow feed, to help to maintain their condition.

SWINE.

Pigs are rapidly increasing in weight, and show a much quicker development on new season's wheat. Hereunder is a table showing weekly increase in live weight of young pigs, weighed during the month, along with the weight of pollard and skim milk used, and price of same. The pigs were, as shown, six weeks old at first weighing, and were weaned a week previously. The crossbred pigs are from a large Yorkshire-Berkshire sow by a pure Berkshire boar. The pure breds are inbred, the sow having been served by her full brother. It was noticeable in the weighing for the week ended 18th February, 1920, that both lots of pigs had not gained as much in weight as during the previous week, no reason for which can be assigned, whilst the gain at subsequent weighing was made at a considerably increased cost for feed.

TABLE SHOWING WEEKLY INCREASE IN LIVE WEIGHT OF PIGS, AND POLLARD, ETC., USED, WITH PRICE, DURING FEBRUARY, 1920.

—	Age.	Date of Weighing	Total Weight in lbs.	Increase in 7 days in lbs.	Pollard used in lbs. at 1d. per lb.	Skim Milk used at 1d. per gallon.	Cost of Pollard.	Cost of Skim Milk.	Total Cost.
							s. d.	s. d.	£ s. d.
Cross-bred 11 pigs.	6 wks.	4.2.20	278	..	..	..	..	..	..
	7 ,,	11.2.20	339	61	61½	20 gals.	5 1½	1 8	0 6 9½
	8 ,,	18.2.20	395	56	57½	15 ,,	4 9½	1 3	0 6 0½
	9 ,,	25.2.20	455	60	88	17 ,,	8 2	1 5	0 9 7
		Total gain ..		177 lbs.			Cost of Feed ..		1 2 5
Pure Bred 6 pigs	6 wks.	4.2.20	143	..	..	..	..	..	..
	7 ,,	11.2.20	173	30	30½	12 gals.	2 6½	1 0	0 3 6½
	8 ,,	18.2.20	197	24	31	9 ,,	2 7	0 9	0 3 4
	9 ,,	25.2.20	232	35	63	11 ,,	5 3	0 11	0 6 2
		Total gain ..		89 lbs.			Cost of Feed ..		0 13 0½

RAINFALL IN VICTORIA.

Fourth Quarter, 1919.

District.	—	October.	November.	December.	Year.
		Points.	Points.	Points.	Points.
Mallee North ..	Mean ...	27	55	187	1,007
	Normal ...	116	95	81	1,317
	Per cent. Departure ...	-77	-42	+131	-24
Mallee South .	Mean ..	45	44	150	1,191
	Normal	121	102	95	1,393
	Per cent. Departure	-63	-57	-58	-14
North Wimmera ...	Mean ...	81	18	180	1,324
	Normal	147	112	101	1,639
	Per cent. Departure	-45	-84	+78	-19
South Wimmera ..	Mean	112	24	111	1,542
	Normal	191	135	118	2,003
	Per cent. Departure	-41	-82	-6	-23
Lower Northern Country	Mean ...	50	81	206	1,483
	Normal	144	120	107	1,701
	Per cent. Departure	-65	-32	+92	-13
Upper Northern Country	Mean ..	63	85	241	1,522
	Normal ...	187	141	130	2,004
	Per cent. Departure	-68	-40	+85	-24
Lower North-East .	Mean ...	121	112	558	2,339
	Normal	270	207	193	2,875
	Per cent. Departure	-55	-46	+189	-19
Upper North-East	Mean ...	168	155	660	3,498
	Normal	396	306	276	4,323
	Per cent. Departure	-58	-49	+139	-19
East Gippsland	Mean ..	177	176	568	3,744
	Normal ..	292	229	261	2,993
	Per cent. Departure	-39	23	+116	+25
West Gippsland	Mean	198	162	462	3,725
	Normal	337	268	277	3,452
	Per cent. Departure ..	-41	-40	+67	+8
East Central ..	Mean ..	192	120	374	3,052
	Normal	326	274	280	3,387
	Per cent. Departure ..	-41	-56	+34	-10
West Central ..	Mean	133	81	280	2,349
	Normal ...	220	184	173	2,360
	Per cent. Departure ..	-40	-56	+62	–
North Central ..	Mean ..	115	80	278	2,239
	Normal ..	240	201	183	2,644
	Per cent. Departure .	-52	-60	+52	-15
Volcanic Plains ...	Mean .	123	61	177	2,072
	Normal ..	223	185	162	2,401
	Per cent. Departure	-45	-67	+9	-14

RAINFALL IN VICTORIA—*continued.*

District.	—	October.	November.	December.	Year.
		Points.	Points.	Points.	Points.
West Coast	Mean	179	52	135	2,743
	Normal	271	207	180	2,995
	Per cent. Departure	−34	−75	−25	−8

N.B.—100 points = 1 inch.

REMINDERS FOR APRIL.

CATTLE.—As the nights become colder the dairy cows should be rugged. The rugs should be removed in day-time when the shade temperature reaches 60 degrees. If new grass is plentiful, give a ration of hay or straw, whole or chaffed, to counteract the purging effects of young grass. It will be found profitable to give a few pounds of bran, crushed oats or pollymeal in addition to other feed, to all cows giving a fair quantity of milk. Read article by Mr. B. A. Barr, "Food Values and Rations," in *Journal* for September, 1916. Algerian oats should be sown on suitable land for grazing off in the winter. Sow a mixture of oats, rye, and tares or peas for winter fodder or to fill silos. Only exceptional cows or those required for city milk supply should be served between now and July. Within the next two or three months is the best time for cows to calve, as they will pay to feed through the winter, give the best returns for the season, and be dry when the feed is dry and at its worst. Calves should have lucerne hay or crushed oats when grass is not plentiful. Take care that salt lick previously recommended is available. One or two pounds of linseed cake or meal given daily should be found beneficial. In addition to its feed value, the oil in the cake or meal will counteract the effect of dry feed, which is liable to cause impaction.

SHEEP.—Merino and fine cross ewes, if mated early, will lamb from now on. Those in lamb to the larger British breeds of rams can be expected to give a certain amount of trouble in lambing.

Close attention should be given morning and evening to save every lamb possible, and pick up any ewes that may be cast. If the ewes are well-woolled sorts, they will need crutching, at the same time clear wool from around teats, and from the eyes. If the ewes are attentive mothers, any lambs that are found dead after these precautions, apart from weather conditions, foxes, &c., are just as well gone. Give purgative drenches at first sight of ewes appearing ill in any way. Give warm salad oil to any lambs that are dull in appearance. Ewes after difficult parturition or retention of after-birth can often be saved by flushing out with ½ oz. Lysol to 3 pints warm water. Reserve fresh pasture, or better still, sow a mixed green crop to turn ewes into later on, but not while carrying the lambs, this is too often injurious. On fine mornings when attending ewes, if feed is plentiful and ewes strong castrate as many ram lambs as possible, they are easily caught when two or three days old. Place them between the feet on the ground, no holder is necessary. In districts where conditions make second dipping a necessity, see that it is done before the weather becomes too unsettled.

PIGS.—Sows not already served should be put to the boar. Supply all pigs with plenty of bedding, and see that sties are warm and well ventilated. Supply sows liberally with grain. Castrate young boars as early as possible. Pigs should be highly profitable now, as pork is very dear. Rape, barley (especially skinless), oats, &c., may be sown for grazing during winter.

POULTRY.—Do not feed maize this month—soft food aids moult; add a teaspoonful of linseed to each bird's ration once daily. The more exercise the hens get the better they moult. Add to drinking water one packet of Epsom salts to twenty birds. Keep a sharp look out for chicken pox. Forward pullets should now be in their winter quarters, with plenty of scratching litter, and fed liberally—including ration of animal food. Grit, shell, and charcoal should always be available.

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FLAX AND ITS CULTIVATION.

P. Ryan, B. Ag. Sc., Acting Secretary, Commonwealth Flax Committee.

For the past twenty years or more flax for fibre has been grown on a limited scale in the Gippsland District of Victoria, and attempts have also been made to establish its cultivation in other States, but owing to the low price of fibre the returns obtained were not sufficiently lucrative to induce farmers to grow flax in preference to the other farm crops.

In order to stimulate the production of flax products, the Commonwealth Government, under the Bounties Act of 1907, granted a bounty of 10 per cent. on the market value of all fibre and linseed produced in Australia, but this Act was not largely availed of, and did not result in any material increase in the acreage sown. When the Bounties Act was allowed to lapse in 1917, the area devoted to flax in Victoria was about 400 acres.

Australia's Present Opportunity.

At this time the whole position with regard to the cultivation of fibre plants underwent a radical alteration. Prior to the war Russia produced more than 80 per cent. of the world's fibre, and owing to the extreme cheapness of labour in that country she was able to place fibre on the market at a comparatively low cost, with the result that the price of fibre in Australia was approximately from £40 to £50 per ton. With the passing of the flax-growing districts of Russia into German hands and the disorganization of the flax industry in France and Belgium, the shortage of fibre for civil and military needs became more and more acute, and prices rose over three times their pre-war level.

With the object primarily of assisting Great Britain to overcome this shortage, the Commonwealth Government guaranteed £5 per ton for standard flax grown during 1918, and under this guarantee the area sown to flax was increased to 1,400 acres. The guarantee for the 1919 crop was increased to £6 per ton, and the area sown that year was

2,200 acres. The treatment of the 1918 crop at the mills is now nearly completed, and an interim dividend of £2 per ton will be distributed this month (April, 1920) to growers, in addition to the £5 already received. Further dividends will be made available on realization of the whole harvest.

The cessation of hostilities has not relieved the shortage of fibre, but rather accentuated it. Stocks of linen throughout the world have been depleted, and there are no reserves of raw material upon which to draw. The opinion is strongly held in English trade circles that remunerative prices will rule for many years, and it is considered most unlikely that prices will ever reach their pre-war level.

In order to encourage farmers to take advantage of this unprecedented opportunity of firmly establishing the flax industry, the Commonwealth Government has guaranteed a price for the flax grown during the next three years. With a three years' guarantee of remunerative prices there is every incentive to farmers in suitable districts, to not only grow flax, but to co-operate in the erection of flax mills for the treatment of the flax straw. The guarantee for 1920 is £6 per ton, and for 1921 and 1922 £5 per ton for raw flax.

Australia imports annually flax products to the value of £1,800,000, and as it has been demonstrated that flax can be grown to perfection in many parts of our continent, any neglect to take full advantage of the present favorable opportunity to develop the industry would be a serious reflection on Australian initiative and enterprise.

Flax for Fibre.

Flax (*Linum usitatissimum*) is to-day one of the most important "dual purpose" crops. The fibre obtained from the straw has a wide range of usefulness, supplying the raw material from which the finest linen, as well as the strongest cordage, can be manufactured; while the seed, known as linseed, is one of the most concentrated and fattening of stock foods. Even after the extraction of the oil, the residue, linseed meal, is a very valuable cattle food. Linseed oil has many uses, and is the chief ingredient of paint.

Flax may be grown either for fibre or seed, and the climatic requirements and cultural operations vary somewhat with the purpose for which the crop is grown. As most flax grown in Victoria is used primarily for the production of fibre, this side of the industry may be dealt with first.

Climate.

For the production of fine long fibre of even quality, the plant requires a rather slow development with few, if any, sudden checks. Success in the raising of such plants could be looked for in districts with a rainfall of upwards of 26 inches, where the spring is cool and moist.

Soils.

Flax is a hardy plant, and provided the land is well drained it will thrive on a variety of soils, but it prefers a free loamy or chocolate soil with a clay subsoil. Good potato land is admirably suited for it, and, generally speaking, satisfactory returns will be obtained from flax when grown under conditions that would produce a good crop of oaten hay

Among the districts that appear well suited in both soil and climate for the growth of flax are: Central Gippsland, particularly in the vicinity of Drouin, Warragul, Traralgon, and Morwell; Sale, Koo-wee-rup, Lancefield, Romsey, Kyneton, Ballarat, Colac.

Cultural Requirements.

The cultivation does not present any special difficulties. The method is very similar to that required for an oaten hay crop, and the cost of production is very little more. The preparation of the seed bed is most important.

1. The working of the land should be such as will produce a fine tilth and leave the surface as level as possible so as to facilitate cutting close to the ground with the binder and thus reduce the loss of length to a minimum. As good length is one of the most important requirements for flax for fibre the necessity for this precaution is apparent.

2. The land should be clean and free as possible from weeds, especially strongly-growing ones such as wild turnip, dock, thistles, &c. Flax, being a fine-stemmed slow-growing plant, is ill-adapted to compete with weeds, especially in its early stages. Should weeds appear after the flax is beginning to grow, they should be cut or pulled out, as there is no crop in which they are more pernicious, for not only do they reduce the yield, but they cause loss and inconvenience in the subsequent treatment at the mills.

Seeding.

Victorian experience has definitely proved that the best time for sowing is from the middle of April to the middle of May, though this may be varied somewhat according to locality and situation; but early seeding is strongly urged for all districts, the object being to have the plants firmly established before the winter sets in. In some districts sowing is prolonged as late as the latter part of June, but unless the spring is exceptionally favorable, there is a danger of such crops being very short, and the comparatively few instances of flax crop failures in the 1918 and 1919 seasons were practically all directly due to the lateness of sowing.

For fibre, seed is sown at the rate of 60 to 70 lbs. to the acre, and may be either drilled in or broadcasted (preferably the latter), and then lightly harrowed and rolled. A broadcast effect may be obtained with a drill by taking out the seed tubes and allowing the seed to dribble on a board set at a slight angle. As the seed is large enough to sow separately there is no necessity to mix it with the fertilizer. If the seed be drilled in, it should be sown very shallow (from ½ to ¾ inch deep; otherwise it may fail to germinate.

Seed.

The variety of linseed almost exclusively sown in Victoria is "blue flowering Riga," which has been developed in Drouin district from a small consignment imported some years ago. Growers are strongly advised to use only good Victorian acclimatized seed, as the results obtained from the sowing of imported seed have been most disappointing.

1 2

In most countries the practice is to grow flax either for fibre or for seed, and not to use the one crop for both purposes, but in Gippsland it has been found possible to obtain both fibre and seed from the same crop. In order to do so, however, it is necessary to cut the crop when the seed is still slightly immature, and it is a moot point whether better results would not be obtained by sowing linseed which had been allowed to fully mature before harvesting.

There is little doubt that the yield from flax, especially of seed, could be greatly increased by systematic selection. Experiments on flax varieties were inaugurated at the Central Research Farm, Werribee, in 1918, and while they are as yet in the preliminary stage it seems very probable that from a special selection a variety particularly suitable for fibre production will be obtained. Promising results have also been obtained with special seed selection, but of course it will be some time before these new varieties will be available for distribution.

The Commonwealth Flax Committee is distributing good, clean Victorian acclimatized linseed at £1 per bushel, and farmers desiring supplies should communicate with the Secretary, 314 Albert-street, East Melbourne.

Manures.

Bonedust or a mixture of bonedust and superphosphate in quantities of from 1 to 2 cwt. has given very satisfactory results when applied to flax crops. The superphosphate seems to be particularly valuable in assisting the crop to establish itself before the winter sets in.

Flax not an Exhausting Crop.

In some quarters there is a traditional aversion to growing flax on the ground that it exhausts the soil; that this is a misconception is proved not only by chemical analysis, but also by the experience of farmers in the Drouin district, where flax has been grown in rotation with other farm crops for upwards of fifteen years without any deteriorating effect on the fertility of the soil. As a matter of fact, analyses made by the Canadian and United States Departments of Agriculture show that an average crop of flax removes less plant food from the soil than does a crop of wheat or oats. It may also be mentioned that one of the heaviest, if not the heaviest, crop of barley in the Sale district last year was grown on land from which over 2 tons of flax to the acre was taken the year previously.

Necessity for Rotation.

While flax is relatively no more exhausting than an ordinary cereal crop it is essential that it should be grown in rotation with other farm crops, owing to the tendency of land on which it is sown continuously to become "flax-sick." This "flax-sickness" has been shown to be due, not to the exhaustion of the soil, but to the presence in the soil of a fungus disease—Flax wilt (*Fusarium lini*) comparable to, but more virulent than, the well-known disease Take-all (*Ophiobolus graminis*), which attacks wheat crops grown continuously on the same land. The fungus of Flax wilt originates in the soil or in infected seed, and attacks plants at all stages of growth causing them to wilt and die as if for want of water. The remedy consists in rotation of crops in which flax will not be sown on same land oftener than once in four years.

Quite apart from the question of disease it is bad farming both in theory and practice to attempt to crop land continuously with flax. The flax plant has a delicate root system which does not penetrate deeply, and must necessarily, therefore, obtain its nutriment from the upper few inches of soil. Hence to avoid exhausting the surface soil, flax should be grown in rotation with crops which have a more vigorous root system, and are able to penetrate more deeply, and draw a portion of their food materials from the subsoil. For the same reason care should be taken, in preparing flax stubble for the succeeding crop, to plough deep enough to bring up some of the subsoil in order to replenish the surface soil with available plant food.

While we still lack definite experimental evidence as to which is the most suitable rotation in which flax may be grown, it appears to fit in well with most farm crops.

A rotation frequently practised in the Drouin district is flax, oats, or potatoes, rape (fed off). Feeding off the rape with sheep tends to clean the land and keep it free from weeds. In autumn the rape is ploughed about 7 inches deep, in preparation for the flax crop which succeeds it in the rotation. A second light ploughing is given, and the land is then worked down with the cultivator and harrowed and sown in April. Flax also does particularly well after potatoes, the thorough working and heavy manuring of the potato land undoubtedly having a beneficial effect on the succeeding flax crop.

Harvesting.

When grown for fibre, flax is harvested before the seed has fully matured. In Ireland and other European countries no attempt is made to save the seed, but in Victoria it has been found possible, by cutting the crop in the middle of the period between flowering and final ripening, to save the seed without damaging the quality of the fibre.

The crop is ready to harvest when most of the seed bolls have turned brown, though a few of the lower ones may be more or less green. The stems at this stage are usually of a golden colour with the lower portion of the foliage dropping off.

In Europe flax for fibre is pulled by hand. The reasons given for adopting this laborious method are (1) to obtain the full length of straw; (2) to avoid stain and injury which may occur from soil moisture soaking into the cut stems while curing in the stook; (3) to avoid the blunt cut ends of fibre.

The scarcity and high cost of farm labour in Australia renders pulling impracticable, and flax is cut with a reaper and binder like a hay crop. Whatever disadvantages this method may have, as compared with pulling, are more than offset by the diminished cost of harvesting. Moreover, when proper attention has been given to the preparation of the seed bed the surface will be smooth and even, and the crop may be cut very close to the ground, and as the roots contain no fibre the loss will be very small.

Flax is considerably tougher to harvest than oats, and the binder knives, which should be plain, not sickle or serrated, must be in good order. It cuts more easily in bright, clear weather, and many experienced growers consider 10 a.m. quite early enough to commence cutting on any day. The sheaves should be of medium size, and well butted, and tied securely nearer the head than the butt, as the tendency

is for the twine to slip towards the bottom. They should be put in long stooks, not round, and stacked when ready, as unduly long exposure in the paddock is not beneficial. A stacked crop allows larger and more even loads to be carted or trucked.

Cost of Production and Returns.

It will be seen therefore that the cultivation and harvesting of the flax crop is much the same as in the case of an ordinary hay crop except that special care is required to get a clean and fine seed bed.

The cost of production varies somewhat, but the following may be taken as a fair average in the Drouin district:—

1. Ploughing, harrowing, and seeding ..	£1 0 0
2. Seed	1 0 0
3. Fertilizer	0 10 0
4. Cutting crop, twine, stooking ..	0 15 0
5. Carting crop	0 5 0
6. Rent	£1 to £1 5s.
Total ..	£4 10s. to £4 15s.

In Drouin district a yield of 2 tons is not uncommon, but the average is 1¾ tons. At £6 per ton this would mean a gross return of to £10 10s. per acre, and a net profit of £5 15s. to £6 per acre, exclusive of any bonus which may be available for distribution, and if present prices are maintained the amount of the bonus would mean a substantial addition. In addition, the flax-grower has the advantage of a guaranteed price which in these days of rapid fluctuations of market prices is an important consideration.

Necessity for Mills.

To firmly establish flax growing in any suitable district it is necessary that a mill be within reasonable distance so that the grower's returns will not be diminished by heavy freight charges. In Victoria individual growers formerly attempted to treat their own flax, but this is not economical, and is likely to be unsuccessful for two reasons:—

(1) The cost of machinery and equipment for a mill would be a heavy burden for any one farmer.

(2) The flax-grower rarely understands sufficient of the technique of retting and scatching to turn out a thoroughly satisfactory product.

The production of high-grade fibre is essential for the success of a mill, and necessitates long experience and technical skill. It is, therefore, better for the farmer to concentrate on the growing of the flax, work for which with experience he will become specially fitted, and to have it treated at a co-operative mill in charge of a competent manager.

By the establishment of co-operative mills the farmers will add to their returns as growers the profit obtained from the milling operations, and there will be every incentive for them to produce the very best quality crops.

Farmers happily are beginning to realize the advantages of co-operation, and the establishment of flax mills seems to be a suitable and profitable investment for co-operative enterprise.

Already two co-operative mills have been established, one at Dalmore and one at Buln Buln. The Commonwealth Government, through the Commonwealth Flax Committee, is willing to advance money at a low

rate of interest to farmers anxious to establish mills, and under the Agricultural Industries Act the State Government is also empowered to do so, and it is hoped that farmers in suitable districts will take advantage of these opportunities to enter on a progressive policy. In addition to the co-operative mills mentioned, there are also flax mills in operation at Drouin, Longwarry South, and Sale. Ordinarily the growing of 300 to 350 acres in any one locality would warrant the erection of a mill, the cost of which need not exceed £700.

Mill Operations.

The processes to which flax is subjected at the mill are threshing, retting, breaking, and scutching.

Threshing.

The first operation after flax is harvested and cured is to remove the seed. As the straw has to be utilized for the production of fibre it is essential that it should not be damaged during the threshing. To ensure this, the practice is to pass the head of the sheaf between two rollers which revolve in opposite directions and are kept pressed together by means of a spring. The mixture of seed and chaff thus obtained is conveyed by means of an endless belt to a winnower where it is cleaned.

Retting.

The retting of flax consists of treatment which will dissolve the gummy material binding the fibre to the woody stem, so that the separation may be effected with the minimum breakage and loss of fibre.

There are two methods of retting known respectively as water-retting and dew-retting.

In the Courtrai district of Belgium, where the finest fibre in the world is produced, flax is retted in the River Lys, and the great success achieved there is probably largely due to the slow movement and peculiarly suitable quality of the water of that stream.

In Ireland what is known as pit-retting is largely practised. For this method dams or ponds of varying length and about 9 feet wide and 4 feet deep are used, and the bundles of flax are packed in almost vertically with the top or crop end up. Mud or sods are then placed on top, and the whole kept down by stones, so that the sheaves are covered by about 3 inches of water. As fermentation proceeds the sheaves tend to rise, and more stones must be put on to keep them down.

The flax should not be packed so tightly as to prevent the free circulation of water, nor should it be too heavily weighed down. After the first week it is tested every day to see if it is properly retted, and when the retting is completed the flax is removed from the pit and spread out to dry.

In Australia the method of retting used is dew-retting, which is also largely practised in Russia. It consists in spreading the threshed flax straw in long rows a few inches apart on a grass or stubble paddock. Dew-retting is really a fermentation in which bacteria, dew, rain, and sunshine all play a part. The length of time the straw is left out varies according to the weather, but is usually about five or six weeks. To insure even retting the flax is turned at least once during this period. When sufficiently retted the straw is picked up, tied in bundles, and if

not quite dry enough stood in stooks, and then stacked until ready for the breaker.

Retting is one of the most important processes to which flax is subjected, and the success of a scutch mill depends largely upon this operation being carried out correctly. If the straw be under-retted the work of scutching is made more difficult and expensive, while if it be over-retted the fibre produced will be lacking in strength.

Up to the present dew-retting has been the only method used in Australia, but a great deal of interest is being displayed in water-retting, and it is intended to make tests on a large scale at the Sale mill this year. While dew-retting has the advantages of cheapness and simplicity, it does not produce quite as good a quality fibre as water-retting, and has the serious disadvantage of being totally dependent on climatic conditions. By the introduction of water-retting it is considered that not only will the quality of the fibre be improved, but also that the quantity of fibre obtained from each ton of straw will be increased.

However, before the introduction of water-retting could be definitely recommended complete information is required on certain points—

(1) The water used for retting should be soft and free from iron, otherwise the quality of the fibre will be affected, and owing to the high mineral content of the water of many Australian rivers there may be some difficulty in obtaining suitable water;

(2) More labour is required for water-retting, and as it is of rather an unpleasant nature, the question arises as to whether the extra cost under Australian conditions would be compensated for by the increased value of the fibre produced.

These problems can only be solved by carefully conducted tests, and it is hoped that the results of the experiments conducted this year will yield definite information.

In view of the primitive methods of retting obtaining in all flax growing countries, many attempts have been made to perform the work by chemical processes, but up to the present the results have not been sufficiently satisfactory to justify departure from existing methods.

Breaking.

The process of breaking reduces the woody portion to short small pieces, called shives, and facilitates its removal by the scutchers, while the fibre which is tough and elastic is uninjured. The breaker consists of pairs of horizontally-placed, fluted or corrugated rollers, the upper ones being pressed against the lower ones by means of springs. The dry, retted straw is fed end-wise in a thin even layer between the fluted rollers and allowed to pass between them to the other end.

Scutching.

From the breaker the straw is passed to the scutcher where the shives are removed by the action of beaters which revolve at the rate of about 300 revolutions per minute. The fibre left in clean lengths is then baled and pressed, and is ready for the manufacturer.

Future Extension of the Industry.

At the present time, owing to the absence of any machinery for manufacturing canvas duck or linen fabrics, the whole of the flax fibre produced in Australia is exported to Great Britain, but the logical sequence to placing the industry on a firm basis will be the establishment of spinning and weaving mills.

War-time experience has shown us the extreme undesirability of being dependent on outside sources for the supply of such essential military requirements as canvas, tarpaulins, and aeroplane cloth, and the establishment of mills for the manufacture of these goods may be regarded as necessary, if only from the stand-point of military preparedness.

Even before the war a Melbourne firm had under consideration the adding of the manufacture of canvas to its other lines of business, and was only prevented from doing so by the uncertainty of obtaining sufficient local supplies of raw material. It is estimated that the annual minimum requirements of a spinning plant would be 1,000 tons of fibre, which would necessitate the cultivation of approximately 12,000 acres annually.

While this is greatly in excess of the present area, there is no reason why the increased acreage should not be sown, in view of the enormous areas where flax can be grown to perfection, and the prospect of the continuance of high prices for many years.

It is universally recognised the war has created an unparalleled opportunity for the development of the flax and linen industries, and other countries are taking full advantage of it.

For example, Japan is now producing some of the finest canvas in the world, and it does not reflect credit on our national enterprise that much of our canvas is imported from that country.

Growing Flax for Linseed.

Up to the present flax has been grown in Australia almost exclusively for fibre, and the linseed has been regarded more or less in the nature of a by-product. In other countries, however, flax for seed alone is an important crop. In the United States 2,000,000 acres are grown annually for this purpose, and in Canada, India, and the Argentine the linseed industry has assumed considerable dimensions. Australia imports annually nearly £500,000 worth of linseed, and her production is practically negligible.

The shortage of linseed is hampering not only the production of linseed oil, but indirectly many other industries also. The present high prices, therefore, afford a favorable opportunity of making Australia self-contained in the matter of linseed supplies and of establishing linseed-growing as one of the permanent agricultural industries.

In common with all other Eastern produce, the price of linseed has been affected by the change in the rate of Indian exchange, and it has now advanced to 23s. 6d. per bushel in Melbourne. It is, of course, impossible to say how long these prices will be maintained, but as there is a world-wide shortage it appears most unlikely that the price will fall below 15s. per bushel within the next twelve months. As a yield

of 8 to 10 bushels may be reasonably expected under favorable conditions, linseed growing should prove an attractive proposition to farmers in the more favoured parts of the wheat belt.

Climate.

In contrast to flax for fibre which needs an annual rainfall of at least 26 inches, flax for seed alone may be successfully grown on rainfall of 18 to 20 inches. It is a significant fact that all the great linseed-producing regions of the world have climatic conditions very similar to those of the wheat belt of Vctoria, namely, high summer temperatures, limited rainfalls, and occasional droughts.

Soils and Cultivation.

So far as soils and cultural requirements, all that has been said with regard to flax for fibre applies with equal force to flax for seed.

The seed should be sown on clean fallow land which should be brought to a finer tilth than is usual for a wheat crop. Flax for seed is drilled in with an ordinary grain and fertilizer drill at the rate of from 30 to 35 lbs. to the acre. The reason for sowing so thinly is to enable the plants to branch out and produce a heavy crop of seed.

Manure.

While definite experimental evidence is lacking as to the manurial requirements of flax for seed it may be taken that superphosphate at the rate of from 1½ to 2 cwt. per acre will be found most effective in the northern parts of the State, and a mixture of superphosphate and bonedust in the moister southern districts.

Harvesting.

When grown for seed flax is allowed to fully mature, and may be harvested with a stripper or combined harvester. Should the latter be used, the blast must be considerably reduced, otherwise some of the seed will be blown away.

A NOTE ON NEW ZEALAND FLAX.

New Zealand flax, a plant that grows extensively in the country from which it derives its name, is cut for its fibre, which is used for making binder-twine, rough rope, &c. It grows only on waste land, and is not a profitable crop on land that can be used for dairying or other purposes.

The plant is not widely grown in New South Wales, and before undertaking its cultivation a local grower would have to arrange for the expensive machinery necessary for its treatment. The flax cannot be cut until the plants reach the age of three years, and the yield under favorable conditions is from 800 to 1,200 lbs. per acre.—*Agricultural Gazette* of New South Wales, April, 1920.

GOVERNMENT CERTIFICATION OF STALLIONS.

Thirteenth Annual Report, Season 1919-20.

By W. A. N. Robertson, B.V.Sc., Chief Veterinary Officer.

For thirteen years the examination of stallions in this State has been conducted under Departmental regulations, and the submission of stallions has been a voluntary act on the part of owners. This, the thirteenth report on the system, will be the last, for under the Horse Breeding Act now in force, it becomes necessary for all owners of stallions used for stud purposes to register them, and to hold a certificate of registration.

It is undoubted that considerable benefit to the horse-breeding industry has accrued from the system of certification in force during the past thirteen years. Breeders have been able to discriminate between sound and unsound sires, and in the mating of high-class mares full advantage has been taken of this knowledge. Amongst the lower grades, however, the same value has not been given to a certificate, and breeding from unsound and nondescript sires has continued to a greater or less extent. Thus the diminution of unsoundness in horses examined has not been as great as would have been the case had all unsound sires been debarred from service during the period under review.

In all, 8,386 stallions have been examined, and 2,348 have been refused certificates. Of this number, 1,125, or 13.4 per cent., were found unsound; and 1,223, or 14.5 per cent., were below a reasonable standard.

During last season, 10 per cent. were found to be unsound; so it will be seen that the rejections under this head were below the average.

As pointed out in previous reports, a study of the figures relating to draught horse gives the most satisfactory basis upon which to determine the success of the system, for the reason that a greater number of this class is examined, and further, this class is more subject to unsoundness than the lighter breeds.

Perusal of the summary of the thirteen years' work shows that 5,244 draught stallions were examined, and 894, or 17.05 per cent., were rejected as unsound. The highest percentage was during the period 1908-1909, when the number rejected represented 27.3 per cent. The lowest was in 1913-14, when 11 per cent. was refused.

During the first three years of the period the average unsoundness was 24 per cent., whilst for the last three years 13 per cent. only were rejected under this head.

It is obvious, therefore, that there has been a slow diminution of the amount of unsoundness detected, but it must be remembered that during the first years many aged horses were examined, whilst of late very few aged animals have been submitted to examination, and of the number many had been previously certificated. Consequently, the figures are not an accurate index of the elimination of unsoundness; they are, however, sufficiently striking to indicate the possibilities which it is hoped to achieve under the Act, the provisions of which will be referred to at a later stage.

EXAMINATION AND REJECTIONS, 1919-20.

Seventy-five parades were held during the past season, and 230 stallions were submitted to the Veterinary Officers for examination. Of the total 23, or 10 per cent., were refused certificates because of the presence of some hereditary unsoundness, and 39, or 16.9 per cent., because they were considered to be below a reasonable standard.

As in previous years sidebone was responsible for the major portion of rejections under the heading of unsoundness, 14, or 6.09 per cent., being rejected on this account. This is a reduction on the figures of the previous year, when 9.54 per cent. was found affected.

Six cases of ringbone were detected. They were distributed amongst each class of horse, two draughts, three lights, and one pony being affected. There is a slight increase in the percentage here, but as the numbers are so low no deduction can be drawn.

A question arises here as to why sidebone has been and is the unsoundness most prevelant. Part at least of the answer may, I think, be found in the fact that sidebone is the least observable of all. It will be immediately conceded that a breeder is very much averse to using a stallion showing any lumps or swellings about the legs. Every horseman knows that the first essential of a good horse is clean, sound legs. Now Ringbone, Bog Spavin, and Curb are readily discernible; therefore the stallion owners in the first place, and the owners of mares in the second place, do not use an animal showing any of these noticeable defects. Thus for generations the horse-owner has been automatically culling such unsoundnesses. With sidebone, however, the swelling is, in most cases, not visible, being hidden by hair, or lost in the natural curves of the part. Hence in horses so affected culling has not been carried out, and the unsoundness has become more common. Other factors, both physiological and pathological, have no doubt operated, and must not be lost sight of.

The result of the examinations during last season are set forth in the accompanying table.

TABLE SHOWING DETAILS OF EXAMINATION.

—	Draughts.		Lights.		Ponies.		Total.	
	Examined.	Certificated.	Examined.	Certificated.	Examined.	Certificated.	Examined.	Certificated.
	134	103	70	48	26	17	230	168
	Rejected.	Per cent. Rejected.	Rejected.	Per cent. Rejected.	Rejected.	Per cent. Rejected.	Rejected.	Per cent. Rejected.
Bog Spavin ...	...	...	...	...	...	...	...	...
Bone Spavin	...	...	2	2·86	...	...	2	·87
Curb ...	...	...	1	1·43	...	...	1	·44
Ringbone ...	2	1·49	3	4·28	1	3·85	6	2·61
Sidebone ...	13	9·70	...	...	1	3·85	14	6·09
Stringhalt ...	...	...	...	...	...	...	...	...
Through unsoundness	15	11·19	6	8·57	2	7·69	23	10·00
Through disapproval	16	11·94	16	22·86	7	26·92	39	16·96
Total rejected	31	23·13	22	31·43	9	34·61	62	26·96

RE-EXAMINATIONS.

Seventy-five stallions previously certificated were re-submitted to examination, and only three were found to have developed unsoundness. This is very pleasing evidence of the value of certification, for it may be taken as an index that the factor for the development of unsoundness is diminishing.

The analysis of these re-examinations is as follows:—

HORSES SUBMITTED FOR RENEWAL OF CERTIFICATES.

	3 years.		4 years		5 years.		Totals.	
	Examined.	Certificated.	Examined	Certificated.	Examined.	Certificated.	Examined.	Certificated.
	6	5	32	28	37	32	75	65
	Rejected.	Per cent. Rejected.	Rejected.	Per cent. Rejected.	Rejected.	Per cent. Rejected.	Rejected.	Per cent. Rejected.
Disapproval	1	16·67	3	9·37	3	8·11	7	9·33
Sidebone ..	..	..	..	..	1	2·71	1	1·33
Ringbone	..	..	1	3·12	..	..	1	1·33
Spavin ..	..	..	..	..	1	2·71	1	1·33
Total ..	1	16·67	4	12·5	5	13·51	10	13·33

The following certificates were presented for transfer to Victoria:—New Zealand, 3; South Australia, 1; and 1 South Australian certificate was indorsed for Victorian Shows.

EXAMINATION OF MARES.

The practice of examining stud-book mares was continued during the season, and 18 received certificates of soundness. The analysis of this phase of examination is as follows:—

SEASON 1919-20.

	Stud-Book—Draught Mares.	
	Examined, 23.	Certificated, 18.
	Rejected.	Per cent. rejected.
Sidebone	3	13·04
Ringbone	1	4·35
Stringhalt	1	4·35
Total rejected	5	21·74

The system of the examination of mares will be continued as heretofore.

Appeals.

Only two appeals against the decision of the examining officers were lodged during the year. Both cases were in respect of animals being considered below standard, and in each case the appeal was upheld, and a certificate issued.

Staff.

The work of the individual veterinary officers is set forth in the following table:—

Name of Examiner.	Number Examined.	Number Certificated.	Number Rejected.	Percentage Rejected.
Mr. R. Griffin, M.R.C.V.S.	59	40	19	32·20
Mr. R. N. Johnstone, B.V.Sc. ...	54	43	11	20·37
Mr. W. M. Lerew, G.M.V.C. ...	42	34	8	19·05
Mr. R. Talbot, L.V.Sc.	59	38	21	35·59
M. W. D. Shew, G.M.V.C.	14	11	3	21·43
Appeal Boards	2	2	...	...

It will be observed that the staff is returning to normal numbers. Since the completion of examination Col. E. A. Kendall, C.M.G., B.V.Sc., the remaining member, has returned to duty, and will be available for work under the Act next season. I should like to place on record my appreciation of the work of those officers who, during the very strenuous years past, enable the system to be maintained without break, particularly to Messrs. Griffin and Lerew, who, for portion of the time, carried the whole responsibility.

The Horse Breeding Act.

When the Departmental certification of stallions was introduced, it was recognised that the logical outcome of the system would be registration or licensing under a compulsory system, and the complete elimination of the uncertificated horse, which was allowed to compete with the certificated one. As time progressed the need for such action became more and more pronounced, and stallion owners more imbued with the idea of its necessity. This resulted last year in the passage through Parliament of the Horse Breeding Act to give effect to the desire of all who had the welfare of the horse-breeding industry at heart. No more appropriate time could have been selected, for the number of stallions in the State has probably never been so low, and as a demand for more horses is inevitable, breeding may be placed on a more stable footing.

In effect, the Act gives little more than the force of law to the system previously in vogue, with the important difference that the horse which does not in the future receive the certificate of registration will have to be put out of breeding operations in Victoria. From now onward a stallion which is not registered cannot be used for stud purposes by any person; this precludes his use even with mares of his owner. The argument has been advanced that an owner should be allowed to do as

he likes with his own. Whilst this line of thought may be sympathized with, it must not be overlooked that in breeding horses or stock the progeny are sooner or later placed on the market, and thus unsoundness is perpetuated. If unsoundness is to be removed, then an owner has no more right to perpetuate it than he has to breed from a diseased cow. Under the Act stallion-owners are required to make application for registration prior to the 1st July each year, and with the application a fee of £1 must be forwarded. This condition of application will require careful attention of owners, and it must be made annually. Forms of applications will in due course be sent to secretaries of Agricultural Societies and officers in charge of Police Stations, and they must be completed and forwarded prior to examination. In the past owners have submitted stallions to the veterinary officer at parades. In the future, unless applications are received, there will be no guarantee that a veterinary officer will be in attendance, notwithstanding the fact that a parade has been advertised. Further, unless good cause can be shown why an application has not been forwarded, the officer may refuse to make an examination, and throw on the owner the necessity of arranging for a special examination, and paying a special fee therefor. Should a person purchase a stallion which is already registered, the certificate of registration will hold good for 30 days only, unless the change of ownership is indorsed by the Chief Veterinary Inspector.

In the event of the stallion holding a Life Certificate issued by the Department under the Regulations heretofore in force, or being registered under the Act as a five-year-old, the issue of a certificate of registration will be automatic, for such horses are not, save under exceptional circumstances, required to be submitted to examination. Stallions of three, four, or five years of age will, however, require to be examined, and in making application for registration owners should indicate the most convenient centre at which such examination may be conducted.

As it is now compulsory for every stallion to be registered, it becomes necessary to arrange for a much greater number of parades than formerly. As many districts are without the assistance of local Agricultural Societies, arrangements have been made, with the kind consent of Sir George Steward, Chief Commissioner of Police, whereby a notice will be displayed at Police Stations intimating when and where the nearest parade has been arranged. If good and sufficient reason can be given that the distance to any advertised parade is too great, arrangements may be made for additional parades.

Any person using an unregistered stallion for stud purposes is liable to a fine up to £100. This penalty will apply to the owner of the mare served as well as to the owner of the stallion. The owner of a mare may always protect himself by demanding the production of the Certificate of Registration, or a duly certified copy of same (which may be obtained on payment of a fee of £1). The certificate or copy must also be produced, on demand, to any member of the police force or an officer of the Department of Agriculture.

Owners of stallions will require to take particular care of certificates issued, for they must be returned to the Chief Veterinary Inspector on

expiration, and when application is made for fresh certificate. If not returned re-registration may be refused. Further, in the event of the death, castration, or change of ownership, they must be similarly returned. Should a stallion die during the currency of a certificate, the fact that the certificate is not returned may not be immediately noticed, but on the issue of the next register the absence of such stallion will be obvious, and the reason for its omission sought. Any owner who has not then returned the certificate will become liable for a breach of the Act and Regulations.

There are many thoroughbred stallions of high repute in the racing world which could not be granted a certificate of soundness, yet could command a high fee at the stud for racing purposes. Recognising that such animals are doing little harm to the breeder of utility horses, it has been decided to omit them from the provisions of the Act. This concession will hold only so long as they are used on mares which are registered in a prescribed stud-book. As soon as such stallions are withdrawn from racing, and stand for service of farmer's mares, they become subject to the Act. The service of even one mare not registered in a stud-book would be sufficient to remove the exemption from them.

The Regulations under the Horse Breeding Act are given in detail hereunder:—

1. In the Interpretation of these Regulations, unless inconsistent with the context or subject-matter—

"Act" means *Horse Breeding Act* 1919, No. 3040.

"Approved standard" means a standard which conforms to a reasonable standard in respect of type, conformation, and breeding.

"Certificate" means a certificate for the time being in force of registration under this Act.

"Chief Veterinary Inspector" means the Chief Veterinary Inspector of the Department of Agriculture.

"Inspection Parade" means a parade of a stallion or stallions for the purpose of examination under this Act with a view to determining whether or not it or they is or are sound and of approved standard

"Owner" means any owner (whether jointly or in severalty and whether absolutely or a lessee) or person in possession or charge of a stallion.

"Prescribed" means prescribed by this Act or the regulations.

"Register" means the register of stallions kept in pursuance of this Act.

"Registered" means entered pursuant to this Act in the register.

"Registration" means registration for the time being in force under this Act.

"Regulations" means regulations made under this Act.

"Sound" means free from such diseases or defects as are deemed by the regulations to constitute hereditary unsoundness, and "soundness" has a corresponding meaning.

"Special inspection parade" means an inspection parade held at the request of the owner of the stallion.

"Stallion" means any male horse or donkey not wholly castrated and over the age of two years.

"Stud purposes" means mating with females for the purpose of procreation

"Thoroughbred mare" and "thoroughbred stallion" means respectively a mare or a stallion entered in any prescribed stud-book or in the register kept by the association known as the Victorian Trotting and Racing Association.

"Veterinary officer" means a veterinary surgeon in the employment of the Department of Agriculture.

2. Every owner of other than a registered thoroughbred stallion which is used for stud purposes with registered thoroughbred mares only shall on or before the first day of July in each year apply in writing to the Chief Veterinary Inspector to have such stallion registered, and with each such application shall forward a fee of Twenty shillings. The application shall be in the following form:—

APPLICATION FOR REGISTRATION OF A STALLION.

(*Horse Breeding Act* 1919.)

The Chief Veterinary Inspector,
Department of Agriculture,
Melbourne.

I (1) hereby apply for registration of my (2) stallion (3) for the period ending 30th June (4) 19 , and I enclose herewith the sum of One pound (£1), being the amount of the prescribed fee. I submit the following true particulars of the above-named stallion.

Date foaled

Sire { Sire's sire
Sire's dam

Dam { Dam's sire
Dam's dam

Signature
Postal address

Date

(1) Name of applicant. (2) Class of stallion—draught, light, pony, thoroughbred. (3) Name of stallion. (4) If application is made after 31st March and before 1st July the "period" is to the 30th June in the following year.

3. Every owner shall submit his stallion or stallions to examination by a veterinary officer at an inspection parade arranged by the Chief Veterinary Inspector, excepting any stallion being five years of age or over registered under the Act or in respect of which a "Life" Certificate has been issued by the Department of Agriculture of Victoria.

4. Secretaries of agriculture societies or similar bodies shall make all necessary arrangements for inspection parades as required by the Chief Veterinary Inspector or by the veterinary officer conducting the examination. Where no such society exists a local police officer will notify owners who inquire of the arrangements made.

5. An owner who is or has been unable to submit his stallion for examination at an inspection parade may apply to the Chief Veterinary Inspector for a special inspection parade, and if the Chief Veterinary Inspector deem the reasons good and sufficient a parade may be arranged on the owner making payment, in advance, of the prescribed fee.

6. The fee for a special inspection parade shall be One pound (£1), together with the amount of railway fare (first class) from Melbourne to the place of examination and return.

7. (*a*) The hereditary unsoundnesses, the presence of any of which will constitute a reason for the refusal of a certificate of registration, are as follow:—

Bog spavin.	Ringbone.
Bone spavin.	Roaring.
Cataract.	Sidebone.
Chorea "shivering" or "nervy."	Stringhalt.
Curb.	Thoroughpin.
Navicular disease.	Whistling.
Nasal disease (Osteo-porosis).	

(*b*) A certificate will also be refused in the case of an animal considered by the examining veterinary officer to be below a reasonable standard as regards type, conformation, and breeding.

(*c*) For the purpose of these regulations "ringbone," "sidebone," and "curb" are defined as follows:—

i. "Ringbone."—Any exostosis on the anterior or lateral aspect of the phalanges below the upper third of the Os Suffraginis shall constitute a ringbone.

ii. "Sidebone."—Any ossification of the lateral cartilage shall constitute a sidebone.

iii. "Curb."—Any circumscribed swelling on the posterior aspect of the hock in the median line and within the lower third of the limits of the hock and the head of the metatarsal bones shall constitute a curb.

8. An owner shall furnish the examining veterinary officer with such particulars concerning a stallion as the officer may require at the time of examination of such stallion (such as name, breeder, pedigree, age, prior ownership, &c.), and if the veterinary officer deems it necessary the owner shall furnish a Statutory Declaration in regard to such particulars.

9. The Chief Veterinary Inspector shall, in writing, notify the owner of any stallion in respect of which a certificate is refused within fourteen days of such refusal, and shall state in such notification the reason for refusal.

10. Until the issue of a certificate or the publication of the Register the result of an examination of a stallion by a veterinary officer shall not be communicated to any person except as herein provided or under circumstances as follow:—

The veterinary officer may, in his discretion, communicate to an owner or an owner's agent duly authorized in writing to inquire the result of examination of such owner's stallion or stallions.

The reason for refusal of a certificate shall not be communicated to any person except the owner concerned or his agent duly authorized in writing, save under the direction of the Court in legal proceedings.

11. The certificate of registration shall be in the following form:—

Victoria.

Horse Breeding Act 1919.

CERTIFICATE OF REGISTRATION.

Issued in respect of the (1) stallion (2) owned by (3) of (4) the above-named stallion, which was submitted to veterinary examination at (5) on (6) and declared free from hereditary unsoundness, may be used for stud purposes until the 30th June, 19 .

Chief Veterinary Inspector.

Department of Agriculture,
Melbourne.

(1) Class. (2) Name, age and description. (3) Owner's name. (4) Owner's address. (5) Place of examination. (6) Date of examination.

12. The certificate of registration shall remain in force until the 30th day of June next following the date of issue. Provided that a certificate issued in respect of a registration made not more than three months before the 30th day of June in any year shall remain in force until the 30th day of June in that year and for twelve months thereafter.

13. An owner shall forthwith, in writing, notify the Chief Veterinary Inspector of the death or castration of his stallion, and shall with such notice return the certificate issued in respect of such stallion.

14. An owner shall forthwith, in writing, notify the Chief Veterinary Inspector of the sale or change in ownership of his stallion, and shall with such notice

forward the certificate issued in respect of the stallion concerned, together with the name and address of the person to whom ownership is transferred. The Chief Veterinary Inspector shall thereupon indorse on the certificate the transfer of ownership and forward it to the person who has become the owner, and unless in such circumstances a certificate is so indorsed within one month after change of ownership the registration and the certificate shall be deemed to be cancelled.

15. An owner may, on payment of a fee of Twenty shillings, obtain a copy of the certificate of registration of his stallion, which copy, if indorsed as such by the Chief Veterinary Inspector, shall be deemed a certified copy.

16. An owner or person in charge of a registered stallion shall, on demand by

(a) the owner or person in charge of a mare to be served; or by

(b) a veterinary officer in the employment of the Department of Agriculture, or any officer authorized, in writing, by the Minister; or by

(c) a member of the Police Force,

produce the certificate of registration issued in respect of his stallion or the certified copy thereof for perusal.

17. (a) If the report of a veterinary officer shows that a stallion is not sound or is not of approved standard, the owner may apply, in writing, to the Chief Veterinary Inspector to have the stallion examined by an Appeal Board.

(b) If the report of the veterinary officer shows that the stallion is not sound the application for examination by an Appeal Board shall be accompanied by a certificate from a registered veterinary surgeon that the stallion has been found by him on examination subsequent to the veterinary officer's examination to be free from the hereditary unsoundness prescribed under these regulations.

(c) If the report of the veterinary officer shows that the stallion is not of approved standard the application for examination by an Appeal Board shall be accompanied by a certificate from the president and two members of the committee of the society which arranged the inspection parade at which the stallion was examined that in their opinion the stallion is of a standard which conforms to a reasonable standard in respect of type, conformation, and breeding, provided that if no such society were concerned in the examination a similar certificate from three equine judges of repute will be accepted.

18. Each application for examination by an Appeal Board shall be accompanied by a fee of Four pounds, together with the owner's undertaking, in writing, to pay such sum for or towards the cost and expenses of the examination as is fixed by the Minister.

If the Minister does not confirm the report of the veterinary officer to which the applicant relates the fee shall be returned to the applicant, and no sum for or towards the cost and expenses of the Appeal Board's examination shall be payable by the applicant.

19. An Appeal Board shall consist of the Chief Veterinary Officer and

(a) where the veterinary officer's report shows that the stallion is not sound such two members (being veterinary surgeons) of the panel of referees

(b) where the veterinary officer's report shows that the stallion is not of approved standard such two members of the panel of referees

as in either of such cases are selected by the Minister.

20. The stud-books prescribed for the purpose of the Act are the *Australian Stud-Book* and the Register kept by the Victorian Trotting and Racing Association.

Summary of Thirteen Years' Work, 1907-1919.

Season.	Draughts. Examined.	Draughts. Certificated.	Draughts. Rejected.		Draughts. Percentage.	Lights. Examined.	Lights. Certificated.	Lights. Rejected.		Lights. Percentage.	Ponies. Examined.	Ponies. Certificated.	Ponies. Rejected.		Ponies. Percentage.	Totals. Examined.	Totals. Certificated.	Totals. Rejected.		Totals. Percentage.
1907-8 ..	403	271	(Unsound)	96	23·82	301	246	(Unsound) ..	32	10·63	214	186	(Unsound) ..	10	4·67	918	703	(Unsound) ..	138	15·04
			(Disapproved)	36	8·93			(Disapproved)	23	7·64			(Disapproved)	18	8·41			(Disapproved)	77	8·38
				132	32·75				55	18·27				28	13·08				215	23·42
1908-9 ..	501	341	(Unsound) ..	137	27·33	295	242	(Unsound) ..	29	9·83	190	159	(Unsound) ..	5	2·5	995	742	(Unsound) ..	171	17·17
			(Disapproved)	23	4·59			(Disapproved)	24	8·13			(Disapproved)	35	17·58			(Disapproved)	82	8·24
				160	31·92				53	17·96				40	20·10				253	25·41
1909-10 ..	410	275	(Unsound)	96	23·52	191	147	(Unsound) ..	12	6·27	156	112	(Unsound) ..	5	3·29	757	534	(Unsound) ..	113	15·04
			(Disapproved)	39	9·56			(Disapproved)	32	16·77			(Disapproved)	39	25·65			(Disapproved)	110	14·65
				135	33·08				44	23·04				44	28·94				223	29·69
1910-11 ..	542	387	(Unsound) ..	117	21·57	143	108	(Unsound) ..	15	10·53	128	101	(Unsound) ..	7	5·47	813	596	(Unsound) ..	139	17·09
			(Disapproved)	38	7·01			(Disapproved)	20	14·08			(Disapproved)	20	15·62			(Disapproved)	78	9·6
				155	28·58				35	24·61				27	21·09				217	26·69
1911-12 ..	692	554	(Unsound) ..	84	12·13	165	121	(Unsound) ..	13	7·87	122	83	(Unsound) ..	5	4·09	979	758	(Unsound) ..	102	10·42
			(Disapproved)	54	7·8			(Disapproved)	31	18·78			(Disapproved)	34	27·86			(Disapproved)	119	12·15
				138	19·94				44	26·66				39	31·96				221	22·57
1912-13 ..	745	597	(Unsound) ..	89	12·03	139	106	(Unsound) ..	19	13·67	70	43	(Unsound) ..	2	2·85	954	746	(Unsound) ..	110	11·59
			(Disapproved)	59	7·92			(Disapproved)	14	10·07			(Disapproved)	25	35·71			(Disapproved)	98	10·27
				148	19·73				33	23·74				27	38·57				208	21·81
1913-14 ..	718	507	(Unsound) ..	79	11·0	157	102	(Unsound) ..	16	10·19	88	60	(Unsound) ..	5	5·68	963	669	(Unsound) ..	100	10·38
			(Disapproved)	132	18·38			(Disapproved)	39	24·84			(Disapproved)	23	26·14			(Disapproved)	194	20·14
				211	29·39				55	35·03				28	31·82				294	30·53

SUMMARY OF THIRTEEN YEARS' WORK, 1907-1919—*continued.*

Season.	DRAUGHTS.				LIGHTS.				PONIES.				TOTALS.			
	Examined.	Certificated.	Rejected.	Percentage.	Examined.	Certificated.	Rejected.	Percentage.	Examined.	Certificated.	Rejected.	Percentage.	Examined.	Certificated.	Rejected.	Percentage.
1914-15 ..	400	267	(Unsound) .. 62	15·50	121	75	(Unsound) .. 14	11·57	82	55	(Unsound) .. 7	8·53	603	397	(Unsound) .. 83	13·76
			(Disapproved) 71	17·75			(Disapproved) 32	26·44			(Disapproved) 20	24·39			(Disapproved) 123	20·40
			133	33·25			46	38·01			27	32·92			206	34·16
1915-16 ..	239	144	(Unsound) .. 47	19·67	71	48	(Unsound) .. 5	7·04	45	28	(Unsound) .. 1	2·22	355	220	(Unsound) .. 53	14·93
			(Disapproved) 48	20·08			(Disapproved) 18	25·35			(Disapproved) 16	35·55			(Disapproved) 82	23·10
			95	39·75			23	32·39			17	37·77			135	38·03
1916-17 ..	188	116	(Unsound) .. 31	16·49	79	40	(Unsound) .. 3	3·80	53	29	(Unsound) .. 2	3·77	320	185	(Unsound) .. 36	11·25
			(Disapproved) 41	21·81			(Disapproved) 36	45·57			(Disapproved) 22	41·51			(Disapproved) 99	30·94
			72	38·30			39	49·37			24	45·28			135	42·19
1917-18 ..	121	82	(Unsound) .. 14	11·57	84	52	(Unsound) .. 3	3·57	32	20	(Unsound) .. 2	6·25	237	154	(Unsound) .. 19	8·02
			(Disapproved) 25	20.66			(Disapproved) 29	34.52			(Disapproved) 10	31.25			(Disapproved) 64	27.00
			39	32·23			32	38·09			12	37·50			83	35·02
1918-19 ..	151	97	(Unsound) .. 27	17.88	75	44	(Unsound) .. 11	14·66	36	25	(Unsound) .. 0	..	262	166	(Unsound) .. 38	14·50
			(Disapproved) 27	17.88			(Disapproved) 20	26·67			(Disapproved) 11	30·55			(Disapproved) 58	22·14
			54	35·76			31	41·33			11	30·55			96	36·64
1919-20 ..	134	103	(Unsound) .. 15	11·19	70	48	(Unsound) .. 6	8·57	26	17	(Unsound) .. 2	7·69	230	168	(Unsound) .. 23	10·00
			(Disapproved) 16	11·19			(Disapproved) 16	22·86			(Disapproved) 7	26·92			(Disapproved) 39	16·96
			31	23·13			22	31·43			9	34·61			62	26·96
			(Unsound) .. 894	17·05			(Unsound) .. 178	9·41			(Unsound) .. 53	4·24			(Unsound) .. 1,125	13·41
			(Disapproved) 609	11·61			(Disapproved) 334	17·66			(Disapproved) 280	22·38			(Disapproved) 1,223	14·58
Grand Total	5244	3741	1,503	28·66	1891	1379	512	27·07	1251	918	333	26·62	8386	6038	2,348	28.00

SUPPLEMENTARY LIST OF LIFE CERTIFICATED STALLIONS.

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date of Examination.	Officer
			DRAUGHTS.			
3208	Baron Juno	5 years	W. T. Manifold	Camperdown	2.9.19	R.T.
3176	Baron Leigh	5 years	Mur Khan	Royal Show Grounds	21.7.19	R.N.J.
3211	Baron Minto	5 years	W. Hermiston	Mansfield	5.9.19	R.T.
3214	Baron Wigton	Aged	Department of Agriculture	Werribee Special	9.9.19	R.G.
3216	Beacon	5 years	R. Stockdale	Warragul	11.9.19	R.G.
3181	Bold Agitation	5 years	W. Cumming	Benalla	1.8.19	W.M.I.
3177	Bold MacGregor	6 years	T. Cantwell	Walpeup	30.7.19	R.G.
3182	Bonnie Brae	5 years	King Bros.	Birchip	30.7.19	R.N.J.
3194	Brestknot	5 years	W. J. Moll	Dimboola	15.8.19	R.T.
3188	Bute Laddie	5 years	Crawford Bros.	Tatura	13.8.19	W.M.I.
3197	Commander	6 years	A. Simon	Tallangatta	18.8.19	R.T.
3186	Ian McClelland	5 years	H. Naylor	Beulah	7.8.19	R.N.J.
3226	Kilmore	5 years	J. Ivill	Orbost	30.10.19	W.D.S.
3205	Kitchener	5 years	Dookie Agricultural College	Dookie	25.8.19	R.T.
3169	Knight of the Garter	Aged	A. and A. Kennedy	Royal Show Grounds	21.7.19	R.N.J.
3225	Lord Valcourt	Aged	J. H. Roulston	Coleraine	11.9.19	Appeal Board
3183	Marshal Clyde	5 years	J. Nunn	Birchip	30.7.19	R.N.J.
3163	Nailstone Fancy	5 years	J. Manning	Horsham	9.7.19	R.N.J.
3219	Oak Burn	Aged	C. A. Roberts	Inglewood	16.9.19	R.G.
3165	Ranfurly	8 years	C. Colyer	Goroke	8.7.19	R.N.J.
3171	Royal Charm	5 years	A. J. Thompson	Royal Show Grounds	21.7.19	R.N.J.
3199	Royal Prince	Aged	W. J. Butcher	Sea Lake	22.8.19	R.N.J.
3190	Royal Success	5 years	F. Kossatz	Nhill	13.8.19	R.G.
3175	Scotland's Sport	Aged	W. Schultz	New Zealand Examination	25.4.19	..
3172	Scottie	5 years	Collis and Nolan	Royal Show Grounds	21.7.19	R.N.J.
3203	Sir Onward	5 years	A. Danson	Numurkah	27.8.19	R.T.
3173	Standard Bearer	5 years	J. Petrie, jun.	Royal Show Grounds	21.7.19	R.N.J.
3185	Sterling Prince	Aged	Cumming and Murphy	Kerang	6.8.19	W.M.I.
3178	The Link	5 years	A. O. Symes	Walpeup	30.7.19	R.G.
3164	Wigton Again	5 years	A. and J. H. Young	Horsham	9.7.19	R.G.
3201	Young Nailstone	6 years	Schroeder Bros.	Murrayville	26.8.19	R.G.
3180	Young Middlemarch	5 years	P. J. O'Donohue	St. Arnaud	31.7.19	W.D.S.
			THOROUGHBREDS.			
3184	Corridella	5 years	W. O'Loughlin	Hopetoun	5.8.19	R.N.J.
3162	Headwind	Aged	Moonee Valley Racing Club	Newmarket Special	28.3.19	R.N.J.
3212	Orinoco	Aged	G. Ritchie and Sons	Mansfield	5.9.19	R.T.
3210	Petrilott	Aged	W. O. King	Ararat	3.9.19	R.N.J.
3187	Phylactery	Aged	T. Gash	Pyramid	7.8.19	W.M.I.
3218	Snow Shoes	Aged	H. Wiseman	Sunbury	10.9.19	R.T.
			LIGHT HORSES.			
3191	All Black	5 years	J. Marks	Elmore	14.8.19	W.M.I.
3195	Angle Jack	Aged	C. F. Hillas	Tallangatta	18.8.19	R.T.
3179	Battarlous	6 years	T. Skelly	St. Arnaud	30.7.19	W.D.S.
3166	Ben Marcelene	6 years	A. T. Cox	Public Offices	14.7.19	W.M.I.
3204	Best Vale	5 years	D. Chilcote	Dookie	25.8.19	R.T.
3196	Bogandyera	5 years	J. Hargreaves	Tallangatta	18.8.19	R.T.
3198	Gratton's Voyage	5 years	Fussl and Glasheen	Bendigo Special	18.8.19	R.N.J.
3192	Hold Up	5 years	A. R. Burns	Rainbow	14.8.19	R.G.
3202	Jack	5 years	I. Tyers	Numurkah	27.8.19	R.T.
3221	Limestone	Aged	E. Miller	Royal Show Grounds	20.9.19	W.M.I.
3213	Mountain Palm	Aged	E. J. Lukey	Public Offices	6.9.19	R.T.
3193	Moving Picture	Aged	W. Fisher	Rainbow	14.8.19	R.T.
3222	Osiris	5 years	C. Knipe	Royal Show	22.9.19	R.N.J.
3170	Prince Mauritius	Aged	Collis and Nolan	Royal Show Grounds	22.7.19	W.M.I.
3206	Wallace	Aged	L. Nash	Dookie	25.8.19	R.T.
3190	Young Shifter	5 years	A. Linke	Jeparit	14.8.19	R.T.

SUPPLEMENTARY LIST OF LIFE CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date of Examination.	Officer.
			PONIES.			
3200	Abdulla King ..	5 years	T. Stevens ..	Euroa	22.8.19	R.T.
3220	Hermes of Shetland Heights	6 years	Mrs. J. Maclellan ..	Royal Show ..	20.9.19	W.D.S.
3167	Little Lonsdale ..	6 years	J. Mahoney ..	Coleraine ..	15.7.19	R.G.
3207	Lord Bally ..	5 years	G. Smith ..	Colac	1.9.19	R.T.
3217	Sun Star ..	5 years	J. T. Unwin ..	Warragul ..	11.9.19	R.G.
3174	Young Cymo Bach	5 years	A. B. Anderson ..	Royal Show Grounds	21.7.19	R.N.J.
3209	Young Recruit ..	5 years	A. E. Osborne ..	Camperdown ..	2.9.19	R.T.

STALLION PARADES.

TIME TABLE, 1920.

Provided the applications for registration indicate that there will be a horse in attendance for examination, a parade will be held at each of the following places:

At Centres where a Veterinary Officer remains overnight a lecture may be arranged.

Date.	Place.	Time.	Officer Arrives.	Officer Departs.
Every Saturday between 26th June and 18th December	Agricultural Offices	10 a.m. to 12 noon		
Tuesday, July 6 ..	Natimuk ..	11 a.m. ..	7 p.m. (5th) ..	12.15 p.m.
Tuesday, July 6 ..	Goroke ..	3 p.m. ..	2 p.m. ..	6 p.m.
Wednesday, July 7 ..	Horsham ..	9 a.m. ..	9.25 p.m. (6th)	2.59 a.m. (8th)
Thursday, July 8 ..	Stawell ..	11 a.m. ..	4.32 a.m. ..	2.48 p.m.
Thursday, July 8	Rupanyup	4.40 p.m.	4.40 p.m. ..	9.45 a.m. (9th)
Tuesday, July 13 ..	Balmoral ..	11 a.m. ..	10.25 p.m. (12th)	12.30 p.m. (driving)
Tuesday, July 13 ..	Toolondo ..	4.30 p.m.	4.30 p.m. ..	8 a.m. (14th)
Tuesday, July 13 ..	Coleraine ..	11 a.m. ..	7.35 p.m. (12th)	Driving
Tuesday, July 13 ..	Casterton ..	3 p.m. ..	Driving ..	6.15 a.m. (14th)
Thursday, July 15 ..	Edenhope ..	11 a.m. ..	4.45 p.m. (14th)	4.30 a.m. (16th)
Tuesday, July 13 ..	Dartmoor ..	11 a.m. ..	10.15 p.m. (12th)	9.55 a.m. (14th)
Wednesday, July 14 ..	Heywood ..	11.45 a.m.	11.45 a.m. ..	12.20 p.m.
Wednesday, July 14	Portland ..	1.30 p.m.	1.5 p.m. ..	2.55 p.m.
Thursday, July 15 ..	Branxholme	10 a.m. ..	5.25 p.m. (14th)	11.20 a.m.
Thursday, July 15 ..	Hamilton ..	2 p.m. ..	12 noon ..	6.35 p.m.
Friday, July 16 ..	Penshurst ..	9.30 a.m.	7.30 p.m. (15th)	10.16 a.m.

STALLION PARADES, TIME TABLE—*continued.*

Date.	Place.	Time.	Officer Arrives.	Officer Departs.
July 16	Melbourne	2.30 p.m.		
July 19 and 20	Royal Show Grounds	10 a.m.		
Tuesday, July 27	Murrayville	[illegible] p.m.	2.30 p.m.	4.30 a.m. (28th)
Wednesday, July 28	Ouyen	11 a.m.	10 a.m.	3.6 a.m. (29th)
Thursday, July 29	Mildura	2 p.m.	7.10 a.m.	6 p.m.
Friday, July 30	St. Arnaud	11 a.m.	7.11 a.m.	2.10 p.m.
Tuesday, July 27	Underbool	2 p.m.	11.32 a.m.	7.20 a.m. (28th)
Wednesday, July 28	Woomelang	[illegible] p.m.	12.15 p.m.	1.10 a.m. (29th)
Thursday, July 29	Birchip	[illegible] a.m.	2.45 a.m.	Driving
Thursday, July 29	Watchem	3 p.m.	Driving	3.15 a.m. (30th)
Friday, July 30	Donald	11 a.m.	5.15 a.m.	12.25 p.m.
Monday, July 26	Devenish	1 p.m.	12.31 p.m.	8.46 p.m.
Tuesday, July 27	Tungamah	11 a.m.	9.31 p.m. (26th)	1.21 p.m.
Tuesday, July 27	Yarrawonga	3 p.m.	2.5 p.m.	7.20 a.m. (28th)
Wednesday, July 28	Benalla	10 a.m.	10 a.m.	11.25 a.m.
Wednesday, July 28	Rutherglen	3 p.m.	1.53 p.m.	7.5 a.m. (29th)
Monday, August 2	Pyramid	3 p.m.	2.28 p.m.	9.30 p.m.
Tuesday, August 3	Koondrook	9.30 a.m.	9.30 a.m.	10.30 a.m.
Tuesday, August 3	Kerang	2 p.m.	11.30 a.m.	4.13 p.m.
Wednesday, August 4	Swan Hill	10 a.m.	6.25 p.m. (3rd)	Driving
Wednesday, August 4	Ultima	1 p.m.	Driving	Driving
Wednesday, August 4	Lalbert	3 p.m.	Driving	Driving
Thursday, August 5	Piangil	10 a.m.	10.25 p.m. (4th)	Driving
Thursday, August 5	Manangatang	1 p.m.	Driving	Driving
Thursday, August 5	Chillingollah	3 p.m.	Driving	Driving
Tuesday, August 3	Sea Lake	10 a.m.	9.25 p.m. (2nd)	Driving
Tuesday, August 3	Kaneira	2 p.m.	Driving	9.54 a.m. (4th)
Wednesday, August 4	Wycheproof	11.40 a.m.	11.40 a.m.	12.30 p.m.
Thursday, August 5	Quambatook	10 a.m.	6.23 p.m. (4th)	11.31 a.m.
Thursday, August 5	Boort	1 p.m.	12.55 p.m.	1.35 p.m.
Friday, August 6	Charlton	11 a.m.	4.7 p.m. (5th)	1.35 p.m.
Friday, August 6	Korong Vale	3 p.m.	2.56 p.m.	3.25 p.m.
Tuesday, August 3	Hopetoun	11 a.m.	9.55 p.m. (2nd)	7 a.m. (4th)
Wednesday, August 4	Warracknabeal	2 p.m.	9.50 a.m.	7.50 p.m.
Thursday, August 5	Beulah	10 a.m.	9.15 p.m. (4th)	11.55 a.m.
Thursday, August 5	Minyip	3.30 p.m.	3.18 p.m.	11.43 a.m. (6th)
Friday, August 6	Murtoa	2 p.m.	12.30 p.m.	5.50 p.m.

STALLION PARADES, TIME TABLE—*continued.*

Date.	Place.	Time.	Officer Arrives.	Officer Departs.
Monday, August 9 ..	Dookie ..	2 p.m. ..	12.40 p.m. ..	4.10 p.m.
Tuesday, August 10	Shepparton ..	10.30 a.m.	5.20 p.m. (9th)	11.38 a.m.
Tuesday, August 10	Cobram ..	2 p.m. ..	1.57 p.m. ..	3.10 p.m.
Tuesday, August 10	Numurkah ..	4.38 p.m.	4.38 p.m. ..	Driving
Wednesday, August 11	Katamatite	11 a.m. ..	Driving ..	Driving
Wednesday, August 11	Nathalia ..	2 p.m. ..	1.37 p.m. ..	3.26 p.m.
Thursday, August 12	Murchison ..	10 a.m. ..	7.3 p.m. (11th)	10.45 a.m.
Thursday, August 12	Rushworth	11.48 a.m.	11.48 a.m. ..	12.25 p.m. (13th)
Friday, August 13 ..	Colbinabbin	1.30 p.m.	1.20 p.m. ..	2.30 p.m.
Monday, August 9 ..	Tallangatta	4 p.m. ..	3.43 p.m. ..	Driving (10th)
Tuesday, August 10	Corryong ..	12.30 p.m.	12.18 p.m. (driving)	2 p.m. (driving)
Wednesday, August 11	Wodonga ..	1.30 p.m.	12.13 p.m. ..	3.5 p.m.
Monday, August 9 ..	Moyhu ..	2 p.m. ..	Driving ..	Driving
Monday, August 9 ..	Whitfield ..	4 p.m. ..	Driving ..	Driving
Tuesday, August 10	Wangaratta	11 a.m. ..	Driving ..	12.39 p.m.
Tuesday, August 10	Bright ..	4.7 p.m. ..	4.7 p.m. ..	6.4 a.m. (11th)
Wednesday, August 11	Myrtleford ..	2 p.m. ..	7.12 a.m. ..	7.12 a.m. (12th)
Thursday, August 12	Beechworth	11 a.m. ..	9.50 a.m. ..	12.51 p.m.
Thursday, August 12	Everton ..	2 p.m. ..	1.11 p.m. ..	3.30 p.m.
Friday, August 13 ..	Euroa ..	10 a.m. ..	6.33 p.m. (12th)	11.12 a.m.
Friday, August 13 ..	Seymour ..	1 p.m. ..	12.11 p.m. ..	8.15 p.m.
Monday, August 16 ..	Maroona ..	3 p.m. ..	2.43 p.m. ..	8.33 p.m.
Tuesday, August 17	Kaniva ..	11 a.m. ..	2.28 a.m. ..	12.42 a.m. (18th)
Wednesday, August 18	Nhill ..	3 p.m. ..	1.22 a.m. ..	1.32 a.m. (19th)
Thursday, August 19	Dimboola ..	2 p.m. ..	2.13 a.m. ..	3.20 p.m.
Friday, August 20 ..	Avoca ..	11 a.m. ..	8.20 a.m. ..	1.40 p.m.
Monday, August 16 ..	Tandara ..	2 p.m. ..	1.3 p.m. ..	7.40 p.m.
Tuesday, August 17	Mitiamo ..	11 a.m. ..	8.29 p.m. (16th)	3.35 p.m.
Wednesday, August 18	Bendigo ..	11 a.m. ..	6.10 p.m. (17th)	12.15 p.m.
Wednesday, August 18	Inglewood ..	3 p.m. ..	1.30 p.m. ..	4.25 p.m.
Thursday, August 19	Castlemaine	11 a.m. ..	7.40 p.m. (18th)	12.56 p.m.
Thursday, August 19	Kyneton ..	2 p.m. ..	1.49 p.m. ..	Driving
Thursday, August 19	Redesdale ..	4 p.m. ..	Driving ..	Driving
Friday, August 20 ..	Romsey ..	11 a.m. ..	10.41 a.m. ..	5.25 p.m.
Monday, August 16 ..	Heathcote ..	2 p.m. ..	11.41 a.m. ..	6.23 p.m.
Tuesday, August 17	Kyabram ..	2 p.m. ..	12.52 p.m. ..	4.25 p.m.
Wednesday, August 18	Tatura ..	10.30 a.m.	5.41 p.m. (17th)	11.44 a.m.
Wednesday, August 18	Echuca ..	2.30 p.m.	2.5 p.m. ..	3.45 p.m.
Wednesday, August 18	Rochester ..	4.30 p.m.	4.25 p.m. ..	9.3 a.m. (19th)
Thursday, August 19	Elmore ..	11 a.m. ..	9.40 a.m. ..	1.40 p.m.
Friday, August 20 ..	Cohuna ..	11 a.m. ..	5.10 p.m. (19th)	12.30 p.m.

STALLION PARADES, TIME TABLE—*continued.*

Date.	Place.	Time.	Officer Arrives.	Officer Departs.
Monday, August 23 ..	Beaufort ..	2 p.m. ..	12.27 p.m. ..	6.47 p.m.
Tuesday, August 24	Larpent ..	4 p.m. ..	3.55 p.m. ..	5.30 p.m.
Wednesday, August 25	Rainbow ..	11 a.m. ..	6.10 p.m. (24th)	2.50 p.m.
Wednesday, August 25	Jeparit ..	4 p.m. ..	4 p.m. ..	10.55 a.m. (26th)
Thursday, August 26	Lorquon ..	1 p.m. ..	12 noon ..	2.50 p.m.
Monday, August 23 ..	Mansfield ..	2 p.m. ..	1.20 p.m. ..	3.30 p.m.
Tuesday, August 24	Yea ..	10 a.m. ..	6.33 p.m. (23rd)	10.33 a.m.
Tuesday, August 24	Alexandra ..	2 p.m. ..	12.25 p.m. ..	4.40 p.m.
Wednesday, August 25	Kilmore ..	10 a.m. ..	9.30 p.m. (24th)	10.36 a.m.
Thursday, August 26	Ballan ..	11 a.m. ..	6.28 p.m. (25th)	12.7 p.m.
Thursday, August 26	Melton ..	2 p.m. ..	1.21 p.m. ..	5.18 p.m.
Friday, August 27 ..	Bacchus Marsh	11 a.m. ..	6.8 p.m. (26th)	12.59 p.m.
Monday, August 23 ..	Camperdown	11.54 a.m.	11.54 a.m. ..	12.25 p.m.
Monday, August 23 ..	Cobden ..	2 p.m. ..	1.10 p.m. ..	3.45 p.m.
Tuesday, August 24	Terang ..	11 a.m. ..	10.22 p.m. (23rd)	Driving
Tuesday, August 24	Mortlake ..	3 p.m. ..	Driving ..	Driving
Wednesday, August 25	Warrnambool	11 a.m. ..	11.32 p.m. (24th)	2.14 p.m.
Wednesday, August 25	Koroit ..	3 p.m. ..	2.42 p.m. ..	12.22 a.m. (26th)
Thursday, August 26	Port Fairy ..	11 a.m. ..	12.52 a.m. ..	1.50 p.m.
Monday, August 30 ..	Daylesford ..	2 p.m. ..	12.4 p.m. ..	3.25 p.m.
Tuesday, August 31	Ballarat ..	11 a.m. ..	6.36 p.m. (30th)	Driving
Tuesday, August 31	Linton ..	3 p.m. ..	Driving ..	Driving
Wednesday, Sept. 1 ..	Clunes ..	11 a.m. ..	8.54 a.m. ..	1.43 p.m.
Wednesday, Sept. 1 ..	Creswick ..	2.30 p.m.	2.16 p.m. ..	Driving
Wednesday, Sept. 1 ..	Smeaton ..	4 p.m. ..	Driving ..	Driving
Thursday, Sept. 2 ..	Maryborough	11 a.m. ..	10.32 p.m. (1st)	12.47 p.m.
Friday, Sept. 3 ..	Navarre ..	9 a.m. ..	7.5 p.m. (2nd) ..	10 a.m.
Friday, Sept. 3 ..	Ararat ..	2 p.m. ..	12.35 p.m. ..	4.20 p.m.
Monday, August 30 ..	Werribee ..	2 p.m. ..	11.47 a.m. ..	5.3 p.m.
Tuesday, August 31	Meredith ..	10 a.m. ..	9.42 a.m. ..	11.13 a.m.
Tuesday, August 31	Geelong ..	2 p.m. ..	12.10 p.m. ..	6.17 p.m.
Wednesday, Sept. 1 ..	Colac ..	10 a.m. ..	8.20 p.m. (31st)	11.15 a.m.
Wednesday, Sept. 1	Beech Forest	3 p.m. ..	2.30 p.m. ..	6.45 a.m. (2nd)
Thursday, Sept. 2nd	Birregurra ..	11 a.m. ..	10.50 a.m. ..	7.53 p.m.
Friday, Sept. 3rd ..	Cressy ..	10 a.m. ..	9.45 p.m. (2nd)	11.5 a.m.
Friday, Sept. 3rd ..	Derrinallum	2 p.m. ..	12.12 p.m. ..	5.7 p.m.
Monday, August 30 ..	Mirboo North	2 p.m. ..	1.50 p.m. ..	4.15 p.m.
Tuesday, August 31	Morwell ..	11 a.m. ..	5.55 p.m. (30th)	11.57 a.m.
Tuesday, August 31	Traralgon ..	2 p.m. ..	12.10 p.m. ..	9.4 p.m.
Wednesday, Sept. 1 ..	Sale ..	11 a.m. ..	10.20 p.m. (31st)	1.50 p.m.
Wednesday, Sept. 1 ..	Maffra ..	4.9 p.m. ..	4.9 p.m. ..	11.8 a.m. (2nd)
Thursday, Sept. 2 ..	Cowarr ..	2 p.m. ..	1.15 p.m. ..	5.1 p.m.
Friday, Sept. 3 ..	Trafalgar ..	10.30 a.m.	6.51 p.m. (2nd)	11.16 a.m.
Friday, Sept. 3 ..	Moe ..	2 p.m. ..	11.31 a.m. ..	6.39 p.m.

STALLION PARADES, TIME TABLE—*continued.*

Date.	Place.	Time.	Officer Arrives.	Officer Departs.
Monday, Sept. 6 ..	Bunyip ..	10 a.m. ..	9.56 a.m. ..	11.25 a.m.
Monday, Sept. 6 ..	Pakenham ..	2 p.m. ..	11.54 a.m. ..	6.2 p.m.
Tuesday, Sept. 7 ..	Neerim South	1 p.m. ..	12.30 p.m. ..	2.10 p.m.
Tuesday, Sept. 7 ..	Warragul ..	3.30 p.m.	3.25 p.m. ..	6.25 a.m. (8th)
Wednesday, Sept. 8 ..	Berwick ..	11 a.m. ..	8 a.m. ..	12.16 p.m.
Wednesday, Sept. 8 ..	Cranbourne	4.37 p.m.	4.37 p.m. ..	8.7 a.m. (9th)
Thursday, Sept. 9 ..	Dalyston ..	2 p.m. ..	10.54 a.m. ..	3.43 p.m.
Friday, Sept. 10 ..	Lang Lang	9 a.m. ..	4.53 p.m. (9th)	9.40 a.m.
Friday, Sept. 10 ..	Dandenong	11 a.m. ..	10.58 a.m. ..	12.39 p.m.
Monday, Sept. 6 ..	Leongatha ..	2 p.m. ..	10.59 a.m. ..	4.7 p.m.
Tuesday, Sept. 7 ..	Foster ..	1 p.m. ..	12.30 p.m. ..	2.21 p.m.
Tuesday, Sept. 7 ..	Stony Creek	3.30 p.m.	3.19 p.m. ..	11.40 a.m. (8th)
Wednesday, Sept. 8 ..	Yarram ..	3.30 p.m.	3.20 p.m. ..	11.30 a.m. (9th)
Friday, Sept. 10 ..	Korumburra	2 p.m. ..	4.45 p.m. (9th)	5.5 p.m.
Monday, Sept. 6 ..	Hastings ..	10.30 a.m.	10.26 a.m. ..	11.27 a.m.
Monday, Sept. 6 ..	Frankston ..	1 p.m. ..	12.7 p.m. ..	2.41 p.m.
Tuesday, Sept. 7 ..	Sunbury ..	2 p.m. ..	1.23 p.m. ..	3.11 p.m.
Wednesday, Sept. 8 ..	Mernda ..	3 p.m. ..	2.48 p.m. ..	8.23 p.m.
Thursday, Sept. 9 ..	Lilydale ..	3 p.m. ..	1.48 p.m. ..	5.31 p.m.
Tuesday, Sept. 14 ..	Omeo ..	3 p.m. ..	Driving ..	Driving (15th)
Wednesday, Sept. 15	Bruthen ..	3 p.m. ..	Driving ..	11.53 a.m. (16th)
Thursday, Sept. 16th	Bairnsdale ..	12 noon ..	11.15 p.m. ..	2.25 p.m.
Tuesday, Sept. 14 ..	Orbost ..	2 p.m. ..	8.55 p.m. (13th)	8.50 a.m. (15th)
Saturday, Sept. 20th	Royal Show	1.30 p.m.		
Monday, Sept. 22nd	.. ..	9 a.m.		

BRANDING AND EAR-MARKING STOCK.

By W. A. N. Robertson, Chief Veterinary Officer.

For many generations branding or ear-marking has been recognised as the only practical means of establishing identity of stock, but unless the use of particular brands or marks is supported by law their value as means of identification of any beast is incomplete, and legal ownership cannot be established. For instance two or more persons in the State, perhaps in the same district, may use identical brands. Therefore, unless the system of branding is controlled by a Brands Act (as is done in all the States of the Commonwealth, with the exception of Victoria), the presence of a brand, whilst it may be accepted as evidence for what it is worth, is not legal proof of ownership. The difficulties met with in the conduct of prosecutions for alleged stealing have frequently been referred to by the Courts of Victoria and the absence of a Brands Act adversely commented upon. The necessity for such a measure is now recognised by all practical men, and several efforts have been made to introduce legislative control.

During last session of Parliament a Brands Bill was passed by the Legislative Assembly, and on reaching the Legislative Council was referred to a Select Committee, which recommended in its report to the House—

(1) That the Bill be not further proceeded with that session.
(2) That a copy of the Bill, together with full explanatory notes, be sent to each agricultural society and to other interested bodies with a view to obtaining their opinion on the Bill.
(3) That the Chief Veterinary Inspector take advantage of the next Convention of the Chamber of Agriculture to explain the provisions of the Bill to delegates.

The one great difficulty in the past which has prevented the passing of a Brands Act in Victoria has been the fact that, under existing systems, the number of marks or brands—but particularly the former which are available are insufficient to provide each applicant with a distinctive mark. In other States the difficulty has been overcome by providing for different districts and duplicating the series of marks. In New South Wales there are at present 67 different sheep districts. The difficulties which result from such a system are not very evident in a State like New South Wales with its vast area, but in Victoria, with the constant interchange of sheep from one district to another, such a method would lead to considerable confusion.

In providing a sufficient number of brands the difficulty is overcome by the use of a three-piece brand, *i.e.*, two letters and a numeral or two numerals and one letter—the combination which can be made from three such signs being very large. To introduce such a system in Victoria would require the discovery of a new combination in order to distinguish from three-piece systems now in vogue, otherwise we would be using a duplication of a system of another State. One great disadvantage of such a method is that the size of the signs must be large to avoid confusion, and the resulting loss from depreciation of hides is very considerable.

Information received from the United Tanners' Federation of Great Britain and Ireland indicates that on pre-war prices the loss on Australian hides owing to the damage done by the brands now used amount

to 6d. per lb., or from 5s. to 7s 6d. per hide, a total loss of approximately £500,000 per annum to the stock-owners of Australia. At the present rates ruling for hides the loss is quite double.

The necessity for legislative control and the difficulties to be overcome in Victoria led me to try to devise a plan whereby a sufficient number of brands and ear-marks could be supplied to provide each and every applicant with a distinctive brand or mark. After a considerable amount of time and thought given to the matter, a scheme has been devised which will supply, if necessary, a separate and distinct mark or brand to every stock-owner in Australia. A patent has been applied for the method, which is described as—

Robertson's Method of and Means for Branding and Earmarking Stock.
(Copyright—All rights reserved.)

The scheme is essentially a numerical one; signs or symbols are used to indicate various values, and by addition the registered number of the owner of the brand or mark is quickly ascertained.

Ear-Marking.

The ear of any beast may be so divided as to establish different positions. For the purpose of this method these are set forth in Plate I., and are referred to as 1st, 2nd, 3rd, 4th, 5th, and 6th position. To each position a value is given which is respectively 1, 2, 4, 8, 16, and multiples to 96, and 1,600 and its multiples. It is necessary to firmly establish in the memory these positions and their values. Different marks are now used in these positions.

Fig. 2 shows the unit notch; it is used in any or all of the first four positions and in no other.

Fig. 3 shows the notch in the 1st position and the value of the mark is one.

Fig. 4 shows the notch in the 2nd position and the value is two.

Fig. 5 shows the notch in the 1st and 2nd position and the value is three.

Fig. 6 shows the notch in the 3rd position and the value is four.

Fig. 7 shows the notch in the 1st and 3rd position and the value is five by adding four and one.

Fig. 8 shows the value six by adding four and two.

Fig. 9 shows the value seven by adding four, two, and one.

Fig. 10 shows the value eight the unit notch in the fourth position.

Fig. 11 shows the value nine by adding eight and one.

Fig. 12 shows the value ten by adding eight and two.

Fig. 13 shows the value eleven by adding eight, two, and one.

Fig. 14 shows the value twelve by adding eight and four.

Fig. 15 shows the value thirteen by adding eight, four and one.

Fig. 16 shows the value fourteen by adding eight, four and two.

Fig. 17 shows the value fifteen by adding the unit notch in each position—8, 4, 2, 1.

The number 16 is the next one required. This is provided for in position 5 at the tip of the ear, and a swallow is used. Whenever this is present 16 is added to any other marks. With 16 showing in the tip (Fig. 18) the unit notch may then be used in any of the positions 1 to 4, to add as previously shown a further 15 or a total of 31. The

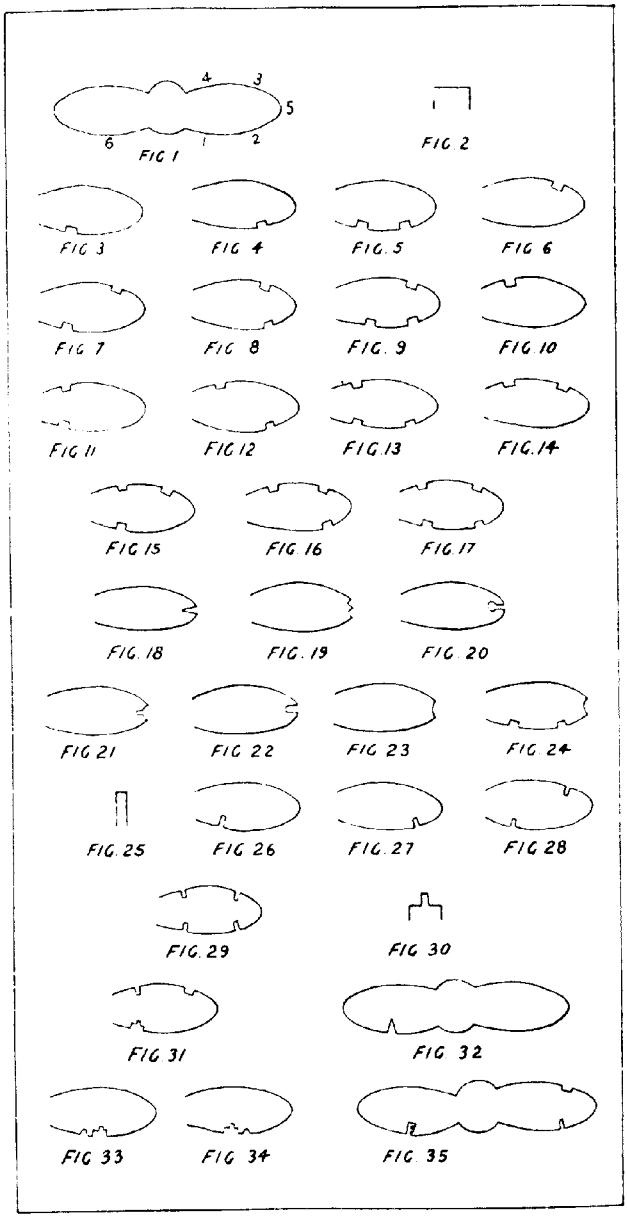

4
3
5
6
1
2
FIG 1
FIG 2
FIG 3
FIG 4
FIG. 5
FIG 6
FIG 7
FIG 8
FIG. 9
FIG 10
FIG 11
FIG 12
FIG 13
FIG. 14
FIG 15
FIG 16
FIG 17
FIG. 18
FIG. 19
FIG 20
FIG 21
FIG 22
FIG 23
FIG 24
FIG. 25
FIG 26
FIG. 27
FIG 28
FIG. 29
FIG 30
FIG 31
FIG 32
FIG 33
FIG 34
FIG 35

Plate I.

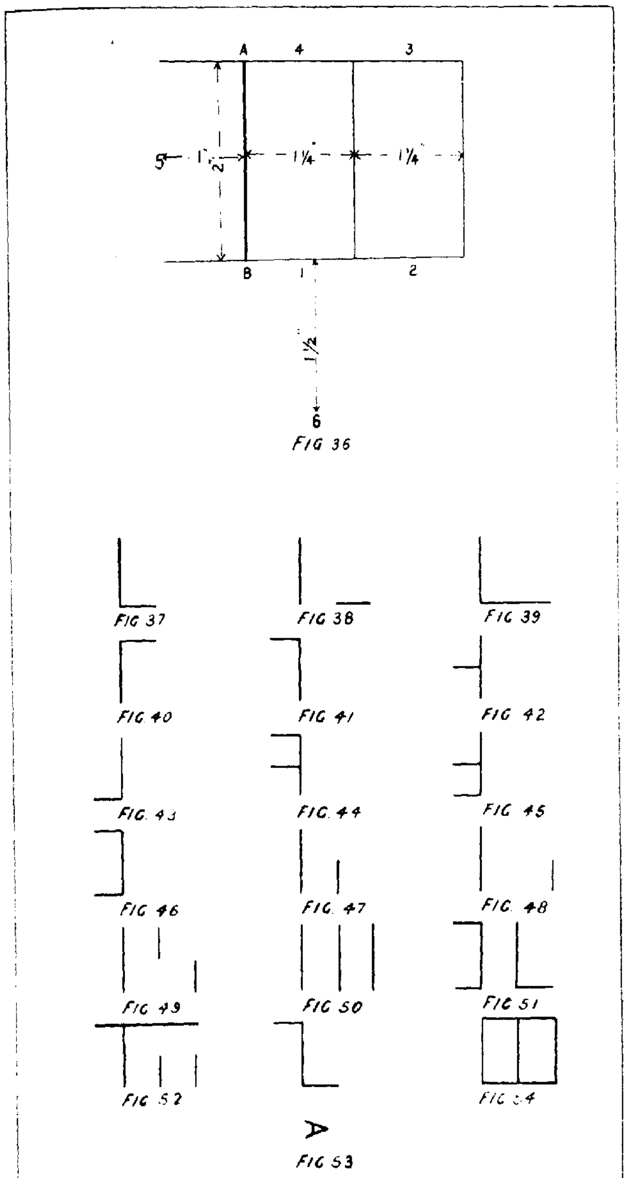

A
4
3
5
1"
2"
1¼"
1¼"
B
1
2
1½"
6
FIG 36
FIG 37
FIG 38
FIG 39
FIG 40
FIG 41
FIG 42
FIG. 43
FIG. 44
FIG. 45
FIG 46
FIG. 47
FIG. 48
FIG 49
FIG 50
FIG 51
FIG 52
FIG 54
FIG 53

Plate I.

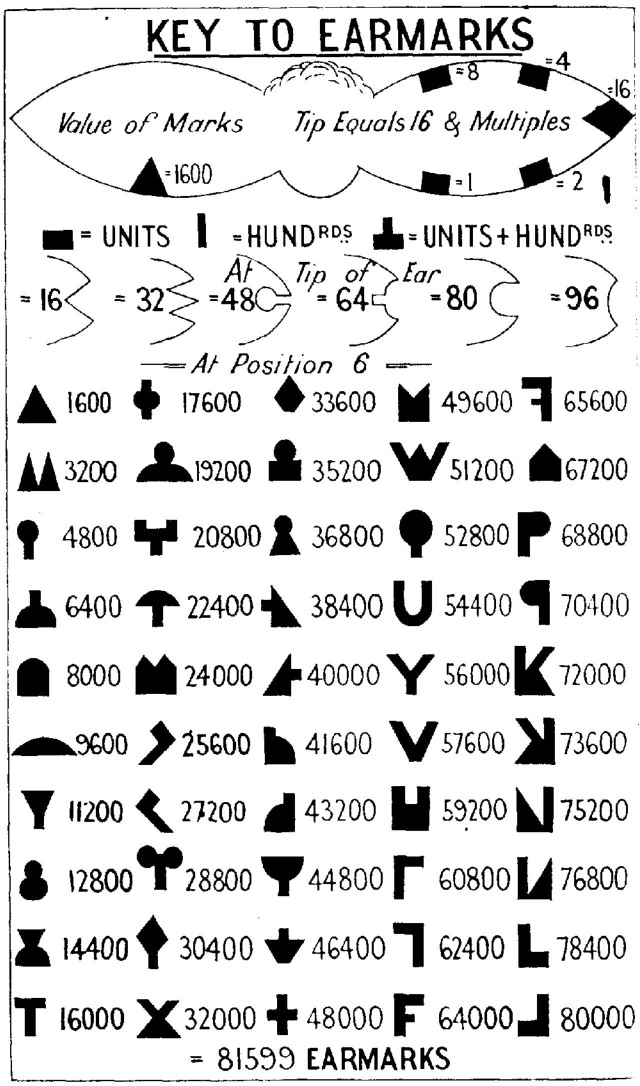

KEY TO EARMARKS
Value of Marks
Tip Equals 16 & Multiples
=1600
=8
=4
=16
=1
=2
= UNITS
=HUNDRDS
= UNITS + HUNDRDS
At Tip of Ear
=16
=32
=48
=64
=80
=96
At Position 6
1600 17600 33600 49600 65600
3200 19200 35200 51200 67200
4800 20800 36800 52800 68800
6400 22400 38400 54400 70400
8000 24000 40000 56000 72000
9600 25600 41600 57600 73600
11200 27200 43200 59200 75200
12800 28800 44800 60800 76800
14400 30400 46400 62400 78400
16000 32000 48000 64000 80000
= 81599 EARMARKS

Plate II.

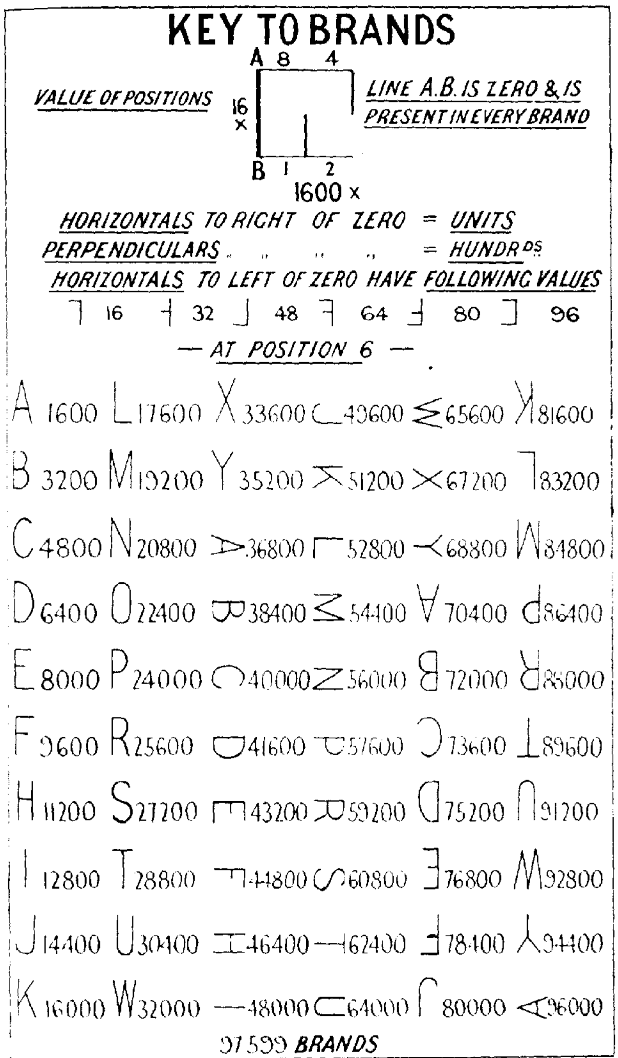

KEY TO BRANDS
VALUE OF POSITIONS
A 8 4
16 x
B 1 2
1600 x
LINE A.B. IS ZERO & IS PRESENT IN EVERY BRAND
HORIZONTALS TO RIGHT OF ZERO = UNITS
PERPENDICULARS " " " " = HUNDRDS
HORIZONTALS TO LEFT OF ZERO HAVE FOLLOWING VALUES
16 32 48 64 80 96
— AT POSITION 6 —
A 1600 L 17600 X 33600 49600 65600 81600
B 3200 M 19200 Y 35200 51200 67200 83200
C 4800 N 20800 36800 52800 68800 84800
D 6400 O 22400 38400 54400 70400 86400
E 8000 P 24000 40000 56000 72000 88000
F 9600 R 25600 41600 57600 73600 89600
H 11200 S 27200 43200 59200 75200 91200
I 12800 T 28800 44800 60800 76800 92800
J 14400 U 30400 46400 62400 78400 94400
K 16000 W 32000 48000 64000 80000 96000
97599 BRANDS

Plate III.

next multiple of 16, viz., 32, is now required, and this is obtained by a double notch (Fig. 19) at the tip of the ear, and again, with this having a value of 32, the units 1 to 15 may be added until 47 is reached. 48 is provided for by the mark as shown in Fig. 20, and again additions may be made, and so on for each of the multiples of 16, viz., 32, 48, 64, 80, and 96 as shown Figs. 18 to 23. These six marks only and no others are used in the tip.

These marks and their value require to be memorized. With 96 showing at the tip of the ear we can now add three as shown in Fig. 24 and the value of the mark is 99. One hundred is the next value required, and this is provided for by using a straight, deep notch as shown in Fig. 25. If in the first position it is 100 (Fig. 26), this notch in any of the positions 1 to 4, and in no other, may be used in the same manner as the unit notch to make values up to 1,500.

Fig. 27 shows 200, Fig. 28, 500, and Fig. 29, 1,500. It is thus seen that the units and hundreds are shown in the same positions, but by a different notch. If a unit and hundred are required in the one position a combination mark as in Fig. 30 is used, and both unit and hundred are thus shown. Fig. 31 shows an ear-mark with one of each of the three marks used—800+101+4=905. In reading any ear-mark it is advisable to take the highest number first, viz., the hundreds, then the sixteens and finally the units.

By a combination of this system of building, numbers up to 1,599 are formed in the first five positions. 1,600 is next required, and this is provided for by passing to the opposite ear, to position six, and using a swallow similar to that made for 16 at the tip—Fig. 32 shows 1,600. In this position the mark changes at every 1,600, and 1,599 is added in the other ear. The first six signs in this position are the same as used in position 5 and the numbers 1,600, 3,200, 4,800, 6,400, 8,000, and 9,600 are so formed. After this number is reached a small key is required to show the value of the marks used in position six. From the key reproduced on page 288 (Plate II.), the number of the ear-mark shown in Fig. 35 will be seen to be 64,000+200+4, or 64,204.

The important points to remember in this method are shown in the Key to Ear Marks, viz., the values of the different positions, the three notches used for units and hundreds, and the six notches used at the tip of the ear.

A drawback to using positions in the ear is that the careless marker may put his mark in the wrong position. To guard against this possibility it is provided that wherever a single notch is used, a small notch will be placed beside it termed the Indicator, which will show the supposed centre of the ear as shown in Figs. 33 and 34. The small notch, Fig. 33, being the approximate centre, makes the mark 202 while Fig. 34 is 101. If a double notch is being used the indicator is not necessary, as both positions will be in use, even if both are well towards the tip of the ear.

Branding.

In branding the same method is followed with slight modifications due to the fact that there is no head to form a starting point or tip to use for the multiple of 16. The differences are overcome by providing a line A B (Fig. 36) and referred to as Zero. *This is present in every brand, but has no value other than indicating a commencing point.* From this line positions may be established just as in ear-marking at

1, 2, 3, 4, 5 and 6. The values of these positions are 1, 2, 4, 8, 16, and multiples and 1,600 and its multiples. Lines drawn at right angles to Zero (A B) on the right are units—

Fig. 37 equals value one.
„ 38 „ „ two
„ 39 „ „ two and one.
„ 40 „ „ eight.

In this manner numbers may be provided, as in ear-marking, to 15. 16 the next number necessary is formed by using a line at right angles to Zero on the left (Fig. 41). Then units are used on the right until the next multiple of sixteen is reached. As it is necessary to remember six marks in the tip of the ear for multiple of sixteen so it is necessary to remember six marks on the left of Zero for the same purpose. Fig. 42 equals 32. Fig. 43 equals 48, Fig. 44 equals 64, Fig. 45 equals 80 and Fig. 46 equals 96. Hundreds are next required and they may be provided for by perpendicular lines in any of the first four positions to the right of Zero. Fig. 47 represents 100, Fig. 48, 200, and Fig. 49, 1,000, *i.e.*, 800 + 200. A line in each of the positions would be 1,500 as in Fig. 50. Fig. 51 represents 998 made up thus—800+100+96+2. Fig. 52 shows 100+200+16+12=328. A line in each position for both units and hundred as in Fig. 54 equals 1,515. When 1,600 is reached a letter or figure is used in position 6 for every multiple. To know the value of each letter a small key is necessary (Plate III.). From this it will be seen that ⊳ is valued at 36,800, therefore Fig. 53 represents the number 36,800+16+1=36,817.

Disadvantages of Method.

The first disadvantage of the method noted in ear-marking is that some of the numbers require five marks in one ear, and though these five are made with only three cuts of pliers they are on occasion excessive. This difficulty may, however, be avoided, for the brand or ear-mark being interchangeable will allow that any number requiring so many marks need not be allotted as an ear-mark, but should be reserved for use of a person who brands only. A further disadvantage is that an owner may require to have three or four pair of pliers and so apparently the ear-mark would be expensive. To meet this disadvantage provision was made in the Bill passed by the Legislative Assembly last year for a uniform price for pliers required for any individual ear-mark; that is, it provided that a person requiring only one pair for his ear-mark would pay the same price as the person who required even four pairs, the latter obtaining them below cost, the former above. So that no advantage would be gained by one person over another on this head.

The advantage of having an absolutely distinctive ear-mark is considered by all who have inquired into the system to far out-weigh the disadvantages. The method suggested would in some cases take a little longer to carry out than the present haphazard way, but it must not be forgotten that it would give a mark which no one else could legally use, and an animal once ear-marked could always be traced to its breeder, not to one of perhaps a dozen others using the same mark. To a man who has a large number of stock to mark, a number requiring few cuts would be allotted so that time would not be lost, while, by the owner with perhaps only 100 to mark, the extra time required for the use of three pairs of pliers would not be noticed.

Advantages of Method.

First and foremost is the distinctive brand or ear-mark which would for all time establish who was the breeder. Next that the ear or portion of ear not occupied by the registered number is available for other marks if the owner requires, such as age or cull marks, provided always that the fundamental marks as in Figs. 2, 25 and 30 are not used. Permission to use an additional private mark would have to be obtained so as to insure that the registered number was not confused or some other registered number constructed. For example, take the ear in Figs. 10, 14, 18, &c., as long as the fundamental marks were not used

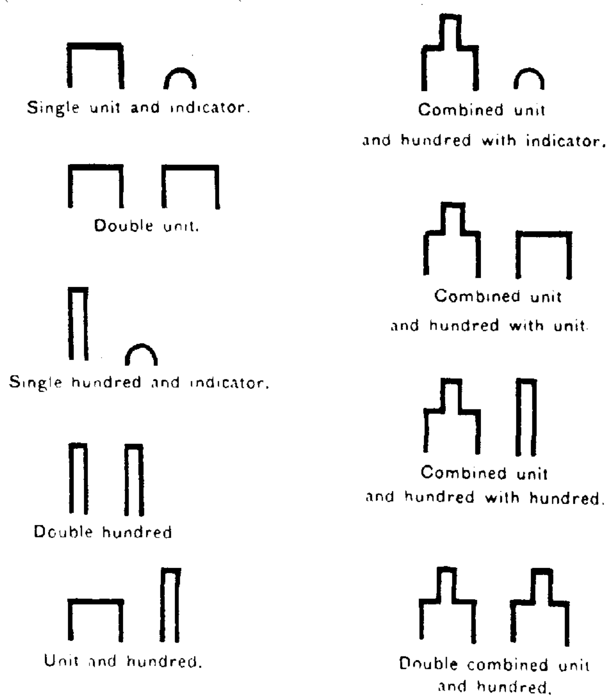


Plate IV.

the ear could be filled with age notches and still the registered number would be clearly read.

A further advantage is the simplicity of the method. Within ten minutes any person by close attention can learn to read the symbols into their correct number. This has been practically demonstrated in the case of children and adults. It is necessary to read all marks as numbers and unnecessary to confuse the mind by determining or referring to the kind of notch other than that signifying "unit" or "hundred." The key to the system as shown on pages 288 and 289 is small, yet complete, and provides for more marks and brands than will be required in Victoria for many years. The register required is

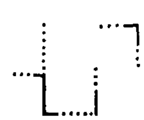
simple in the extreme, an alphabetical list of owners and a numerical list of marks being all that is necessary and from this ready references will be obtainable.

At first sight it might appear that there would be difficulty in placing the marks in their correct positions and that the ear would be likely to be disfigured, but by the aid of the indicator already referred to (Figs. 33 and 34) the former objection is overcome and by using only one pair of pliers to make the two marks necessary in either the front or back of ear, the marks need never be larger than as shown in Plate IV., both marks being included in a space of 1 inch by 7/16th inch deep.

Both ear-marks and brands would be difficult to fake. In the former case it would be almost impossible for a person to add the hundred notch to the unit one so that it would be in the exact centre and at right angles, and, further, the proportionate growth of the mark would not be in unison. For instance, if the unit were placed on the ear before the animal was six months' old and the hundred were added after twelve months, the growth or change in the unit mark would not correspond with that of the hundred mark. The same difficulties would be met with in altering brands. It would be almost impossible to add a line of the correct size at right angles or parallel to Zero, which would grow so as to seem part of an existing brand.

In order to guard against "faking," the draft Bill provided that the ear-mark or brand should be *primâ facie* evidence of ownership; consequently it would be useless for any one to alter a mark unless he could convert it into his own mark and the chance of his being able to do this would be remote.

The possibility of blotching of brands or marks is reduced to a minimum, and should it occur, it would not make the mark indecipherable. No matter what change takes place in the ear, the marks as at Figs. 2, 25, 30, could not become confused with one another. In branding—even if the brand were very indistinct—the correct number could be constructed. For example, in the accompanying diagram, if only marks as shown by the heavy lines were visible, the brand could be reconstructed as shown by the dotted lines, for the visible marks



would indicate which lines were originally meant to be present. The remaining lines in the diagram would show that the number was 537.

If the Bill Becomes Law.

Presuming the method is considered satisfactory and the Bill becomes law, every stock-owner will require to apply for a brand and ear-mark. A number will then be allotted to him, and it will be transposed into its proper mark. It will not be necessary to use both, brand and mark, but one or other will require to be shown on all natural

increase and unbranded stock which come into any owner's possession. The fee for registration is on a sliding scale—

If less than 100 head of stock on the run	..	10s.
If there are 100 and less than 1,000	..	20s.
If more than 1,000	..	40s.

One registration is all that will be required to cover both brand and ear-mark and this will be the only registration necessary and will give the owner sole right to use the brand or mark allotted him. The fees received during the first year (provided all stock-owners register) will represent a sum of approximately £60,000, but it must be remembered that this amount will be required to cover the cost of administration for all time, and that it will include the issue of registers to pound-keepers and police in order that stray or impounded stock may be returned to their rightful owners. Therefore the total must not be considered as high, and the average fee (say, 20s.) will be an insurance for all time.

The Bill provides that none but a registered brand or mark must be used, that is, a person must either register or keep clean skins, but if the owner of a registered brand desires to use a brand which he has been in the habit of using in the past he may apply for the right to continue the use thereof, and provided always the brand is one which will not interfere with or confuse the registered brand, permission to use the same will be granted. It is anticipated that the use of such additional brand will be quickly discontinued as the registered brand becomes known, and that even the brand will seldom be used by the breeder who will rely on the ear-mark for identification.

It will be necessary for owners to use only certain positions for branding, and to follow such positions in rotation. The order in which they must be used is stated in the Bill. This is essential in order to establish ownership, for if an owner were not required to brand his cattle in a rotation system, it would be difficult, in the event of two or more brands being found on a beast, to decide who was the rightful owner, or who had placed the last brand on any animal.

HOW A PURE-BRED FRIESIAN BULL WILL MAKE MONEY FOR YOU.

The Iowa Experiment Station recently conducted an experiment under the direction of Prof. L. S. Gillette. A purebred Friesian bull was mated to scrub cows, and the resulting heifers were bred to another pure-bred Friesian bull. Here's what happened:—Dams' average yield, 3,255 lbs. of milk, 161 lbs. of fat; daughters' average yield, 6,313 lbs. of milk, 261 lbs. of fat; granddaughters' average yield, 11,295 lbs. of milk, 431 lbs. of fat. In other words, the daughters of the pure-bred Friesian bull averaged 94 per cent. more milk and 62 per cent. more fat than their dams, and his granddaughters averaged 245 per cent. more milk and 163 per cent. more fat than the original scrub dams. The short cut to greater dairy profits is a purebred Friesian bull. Think it over.—*New Zealand Dairyman,* 20th March, 1920.

CROP AND FALLOW COMPETITIONS, MINYIP, 1919.

Copy of Report of Judge, Mr. H. A. Mullett, B. Ag. Sc., Chief Field Officer, Department of Agriculture.

I have much pleasure in submitting my report as judge of the recent Crop and Fallow Competition at Minyip.

I dealt fully with the objects of the competitions last year. I would like to remind the farmers that the Agricultural Society hopes to improve by these competitions the farming methods of the district. The immediate object is to discover the best crops each year, and to account as far as possible for their superiority. Just to the extent that farmers are willing to help themselves in this matter so will the worthy object be achieved.

The season was one in which heavy crops were not plentiful, yet it was just the sort of season to throw the best farms into strong relief. The highest skill is required to grow a crop in a season like that just past, yet many good farmers are short-sightedly deterred from exhibiting their crops on the plea that they are not good enough.

The Season.

The official records set down the rainfall as 15½ inches, which is equal to the average for twenty years, but of this only 8½ inches fell in the growing period of wheat, or 4 inches below normal for that period. Three and a half inches fell in February and March, and the balance in December.

Considering the meagre effective rainfall, it is remarkable that the crops have yielded so well. There was a time when a rainfall of this character would have meant a harvest failure, but to-day the crop is rendered to a certain extent less dependent on the rain which falls while it is growing than by the moisture conserved in the fallow from the year before, and the good crops were seen this season where the farmer best understood the secret of doing this effectively. At Minyip, as elsewhere in the Wimmera, the careful working of the fallows after the February and March rains had an important influence on the yields of the crops.

Results—Crops.

SECTION I.—FOR BEST EXHIBITED HALF OF FARMER'S WHEAT CROP ON FALLOWED LAND (THE HALF NOT LESS THAN 50 ACRES).

Name.	Variety.	Yield.	Purity and Trueness to Type.	Disease.	Weeds.	Evenness.	Total.
Possible Points	.. .. ..	35	20	15	15	15	100
A. A. Lutze ..	Known locally as "Huff's Imperial" indistinguishable from Gallipoli	26	16	12	12	14	80

There was only one competitor in this section. The wheat was a variety called "Huff's Imperial," and is indistinguishable from the new departmental crossbred "Gallipoli." It was level and characteristically short. A fair number of strangers was present. The yield was exceptionally heavy for the season, and in every respect it was a most creditable crop.

It was grown on winter fallow, which had been given the following treatment:—The paddock was scarified in July, and then harrowed; in the spring a further scarifying was given. After harvest it was harrowed twice, and then spring-toothed, after falls of summer rain, and finally spring-toothed and drilled at the end of May and beginning of June with 60 lbs. of wheat and 85 to 90 lbs. of superphosphate. The young growing crop was fed off to sheep for a fortnight at the end of July. Special precautions were taken to harrow the crop after removing the sheep.

Messrs. Brown Bros.' Winning Crop of Federation.

SECTION IV.—FOR BEST CROP GROWN ON FALLOW LAND THE FALLOW JUDGED ON POINTS, 1918, AND THE CROP GROWN ON THIS FALLOW, 1919.

(Crop points and fallow points to be added together.)

Name.	Variety.	Yield.	Type.	Disease.	Weeds.	Evenness.	Total for Crop.	Total for last year's Fallow.	Grand Total.
Possible Points		**35**	**20**	**15**	**15**	**15**	**100**	**100**	**200**
Brown Bros. ..	Federation ..	24	18	13	12	14	81	95	176
A. A. Lutze	Gallipoli ..	26	15	12	12	14	79	96	175
A. H. Krelle.. ..	Federation ..	24	16	5	14	14	73	91	164
R. J. Hemphill ..	Federation ..	15	18	10	14	13	70	92	162
W. and J. Mackenzie ..	Federation ..	18	16	5	14	13	66	89	155

The winning crop of Federation in this section—that of Messrs. Brown Brothers—though not quite so heavy as that of Mr. Lutze, nevertheless was much truer to type, and on the whole it was considerably freer from flag smut and takeall. In one corner there was, however, a fair amount of mustard weed.

This crop was grown on summer fallow, which had been scarified in March, and ploughed in July and August to 4 inches deep. In the spring it was rescarified and then harrowed. After harvest the paddock was scarified again after the summer rains; a portion was then rescarified, and finally the whole paddock was re-scarified and sown in June and early July. It was harrowed after the drill, 75 lbs. of Federation seed which had been obtained from a seed station several years ago and 90 lbs. of superphosphate to the acre being used.

Mr. Krelle's crop was on winter fallow which had been thoroughly worked, and it was sown with the combined springtooth cultivator-drill 75 lbs. of seed and 112 lbs. of superphosphate. Points were heavily deducted because the crop was smutted, as was also the case with Mr. Mackenzie's crop.

Mr. Hemphill's crop, though very short, was well headed. It was sown on summer fallow that had been twice ploughed. It is probable that this fallow was by the second ploughing rendered too open and loose, especially in the dry season which followed. It certainly appeared so at the time of judging last November.

Results—Fallow.

SECTION II. FOR BEST FALLOWED LAND NOT LESS THAN 100 ACRES. ALL COMPETITORS' FALLOW TO BE SHOWN.

Name.	Soil	Moisture.	Mulch.	Weeds.	Cultivation.	Total.
Possible Points ..	.. .. ..	**25**	**25**	**25**	**25**	**100**
A. A. Lutze	Black	23	24	24	22	93
A. H. Krelle	Black, red patches ..	22	22	23	21	88
R. J. Cowan	Black	19	23	24	21	87
W. and J. Mackenzie ..	Black	20	22	23	21	86
R. J. Hemphill ..	Black red patches ..	19	21	24	22	86
H. W. Morris	Black, red banks ..	19	21	23	20	83

Mr. Lutze showed in all 318 acres of fallow, 160 acres of which were summer fallow, and the balance winter fallow. The whole had a nice mellow blanket of loose dust over a well-consolidated seed bed. The moisture content was excellent. There was practically a complete absence of weeds, and judgment had been displayed in reducing the whole of the land to an even tilth of good character.

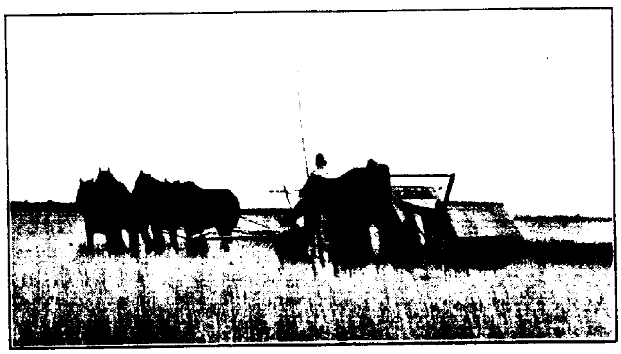
As far as could be judged by the tracks and an examination of the "sole," the cultivating implements had been carefully manipulated, and attention had been given to an even regulation of depth, and the prevention of misses, or too great an overlap.

The summer fallow, which exhibited the highest moisture content, had received the following treatment:—It was ploughed in March to a depth of 4½ inches—having been ploughed more shallowly on the previous occasion—the idea being to plough the land alternately deep and shallow. Subsequently it was harrowed in July, and scarified at the end of August, and again in October.

Mr. Krelle's paddock of summer fallow was also high in moisture, but the mulch being somewhat more shallow than that of Mr. Lutze, the subsoil was beginning to crack with consequent loss of moisture. Points were also deducted for somewhat uneven cultivation of the red patches. The paddock was ploughed in March to 3 inches, and received the following treatment subsequently. Harrowed at beginning of May, again early in July, scarified about the end of July, harrowed second week in August, scarified first week in November, and finally harrowed during the third week in November. The paddock was on the whole highly creditable.

Mr. Cowan's fallow, though attractive in appearance on the black ground, was nevertheless somewhat deficient in moisture. It was winter fallow, and had been well worked. The paddock of red ground was not in good condition.

The remaining fallows were mainly deficient in moisture, generally arising from imperfect mulching. In some cases, however, the actual rainfall since fallowing time had been more favorable than in others.



Mr. Ruwolt Harvesting a Crop of Gallipoli Wheat.

Section III.—Best Crop Grown on Fallow Land—the Fallow to be Judged on Points, 1919, and the Crop Grown on this Fallow to be Judged on Points in 1920.

(Crop and fallow points to be added together.)

Name.	Soil.	Moisture.	Mulch.	Weeds.	Cultivation.	Total.
Possible Points ..	.. .. ..	25	25	25	25	100
A. A. Lutze	Black	23	24	24	22	93
J. Ruwolt	Black	22	23	24	21	90
A. H. Krelle	Black, red patches ..	22	22	23	21	88
R. J. Cowan .. .	Black	19	23	24	21	87
R. J. Hemphill ..	Black, red patches ..	19	20	24	23	86
H. Morris	Black, red banks ..	19	21	23	20	83

In this section the prize will not be awarded till next season, when the aggregate of the points for fallow and the crop grown on it will determine the winner. The whole of the competitors in this section, with the exception of Mr. Ruwolt, are the same as in section II., and their fallows have already been discussed.

Mr. Ruwolt's fallow had been deeply mulched, and consequently was high in moisture. Points were lost for cultivation, the surface being left very deeply furrowed by the scarifier. The paddock, 140 acres, was ploughed in March, then scarified in July and August, and again in September.

The Trend of Wheat-growing Methods in the Wimmera.

It is somewhat difficult this season, in view of the rather patchy character of the rainfall and the relatively limited number of entries, to make accurate deductions from a survey of the crops and fallows seen at Minyip. But in a general way interesting deductions may be made of a survey of the whole of the crops seen in the Wimmera this year.

Summer Fallow.

During the past few years increasing interest has been shown in the summer or fifteen months' fallow on the black soils. At the competitions in the various Wimmera districts during the years 1917 and 1918, wheat crops grown on summer fallow were on the average markedly superior to those grown on winter fallow, but this year, though the summer-fallowed crops have held their own in the five Wimmera districts inspected, they have not done any more than that. It is often claimed that the apparent superiority of summer fallow is due to the extra advantages that it offers for conserving moisture, and this is undoubtedly the case. From this it ought to follow that the greatest advantages would accrue to the crop in a dry season, and on the face of it, it is somewhat difficult to understand why this was not so this year.

Several wheat crops were seen on summer fallow which had been twice ploughed, and well worked in addition; they were generally very moderate crops, and the soil on which they were grown was exceptionally loose and open. This suggests that care should be taken in a dry year to avoid working summer fallow too often with heavy implements, though experience shows that any black fallow can hardly be worked too much after rain.

Apart from the question of yield, two of the advantages of summer fallow are, first, the utilization of the farm labour and horses at a time when it would be otherwise idle, thus easing the strain on the plant at ploughing time, and, secondly, that the summer fallow is the best method of cleaning black land of weeds.

The best Wimmera farmers are finding that it pays to summer fallow a portion only of their land each year. So far there is no definite information as to the comparative yields of the two methods over a series of years, but it is possible that tests will be made on the Experimental Field at Longerenong College in the near future.

Rate of Seeding and Time of Sowing.

The modern tendency on the black soils of the Wimmera is strongly in favour of sowing wheat later than was once the practice, though this year the early-sown wheats were the best. At Nhill and Kaniva May sowing is still preferred, but to the south and east the tendency is to defer sowing till later. The advantages claimed for June and July sowing are that opportunity is afforded of getting a more thorough germination of rubbish than is possible with a May sowing, and that the land can be worked down to a much more satisfactory physical condition. This experience of practical farmers has been definitely corroborated on the Departmental Experimental Plots at Longerenong College over the four years, 1915-1918, inclusive. There July sowings with 60 lbs. of Federation wheat and 1 cwt. of superphosphate have averaged 4½ bushels per annum better than May sowings.

The later sowing is rightly accompanied by an increased dressing of seed, because the later the season the greater the losses which are likely to result in germination. The sowing of 75 to 80 lbs. of wheat is becoming general, and the practice has spread to the districts where May sowing is the rule. It must be confessed that, judging by the large numbers of excellent heavy-seeded crops seen during the past few years, the practice even in these districts appears to be sound. Here again the Longerenong Experimental Plots support the practice. Over the same period, viz., 1915-1918, a 15-lbs. increase in the rate of seeding over the normal 60 lbs. has resulted in an average increase of 2¾ bushels per annum per acre, and there are indications that for the late sowings even heavier seedings will be profitable.

It might be expected that heavy-seeded crops would be likely to suffer severely in a dry season like the present, but such was not the case. Most of the crops occupying prominent positions in the five Wimmera districts where crop and fallow competitions were held this year were heavily seeded. Included in them are those of Messrs. Brown Brothers and A. H. Krelle, of Minyip; Robert Blackwood; and A. J. Buckley, of Nhill; whilst the heaviest Mallee crop at Dimboola, that of Mr. J. Glatz, was sown with 1½ bushels of seed and 112 lbs. of superphosphate.

Manures.

The most reasonable explanation of the payable response of Wimmera soils to heavier seedings seems to be in the increased supplies of plant food which are liberated in modern well-worked fallows. There would be no justification whatever for increasing the seeding on badly-worked land, and the increase should be accompanied by heavier dressings of superphosphate, which is the most deficient element in the soil.

The experience on the plots at Longerenong, Warracknabeal, and elsewhere demonstrates beyond all doubt that applications of 112 lbs. of superphosphate with the seed are more profitable than the usual dressing of ½ cwt.

The average increased yield resulting from an increase of 56 lbs. of superphosphate is in the vicinity of 1½ to 2 bushels of wheat to the acre, which will pay for the extra manure and leave a bushel or so as clear profit. The extra feed in the stubbles which always accompanies the heavy dressings is also highly profitable.

On land which has been drained of phosphorus by prolonged cropping and systematically starved of superphosphate, much heavier returns than these might be expected for the first few years. The behaviour of crops sown with heavy dressings of superphosphate this year should dispel the last doubt in farmers' minds that extra superphosphate "burns off the crop in a dry year."

Sheep Feed.

Minyip is the home of the Wimmera Rye Grass. In view of the claims that have been advanced of its high carrying capacity in normal years, the following particulars of the stock carried at Messrs. McDougal's, Minyip, and on the farm of Mr. A. W. Milbourne, Ailsa, Warracknabeal, may be of interest, as showing the carrying capacity under adverse conditions. Messrs. McDougal, of Minyip, supply the following figures:—

The area under the grass is 1,000 acres; crop, 300 acres; fallow, 150 acres.

Upon the grass the following sheep have been maintained:—Seven hundred ewes were "lambed down," and these with 400 of last year's weaners from last year's lambing were carried forward until September, when 50 ewes and 50 weaners were sold. They topped the Ballarat market, the ewes averaging 43s., and the weaners 27s. Subsequently a further truck of 100 lambs was sold for 20s. 4d., also topping the market. In November 402 lambs and 48 ewes were sent to Murtoa; the ewes averaged 60 lbs. dressed weight, realizing 19s. 5d., and the lambs 28-35 lbs., averaging 27s. 6d. The property at the time of judging (first week in December) was therefore carrying 600 ewes, 350 weaners, and 300 lambs. There was sufficient of the grass, together with the wheat stubbles, to carry these sheep well, the bulk of which were in prime condition, though they could not be profitably disposed of just then owing to a falling market.

At the Minyip Show prizes were taken for (1) the best pen of freezers, (2) best pen of lambs for slaughtering.

Mr. A. W. Milbourne, at Warracknabeal, who has also a large area of the grass, supplies the following figures of its carrying capacity. The rainfall at Warracknabeal was even lighter than at Minyip.

The property comprises 1,200 acres, of which 150 acres are in crop, 150 acres fallow, 50 acres house and horse-paddocks, leaving 850 acres in Wimmera Rye Grass.

Since last shearing-time 900 four and six tooth ewes have been maintained, and these, together with 630 lambs, have been carried until the second week in October, when 1½ trucks of dry sheep, averaging 38s. 6d. in the wool, were sold. At the end of October a start was made to dispose of the lambs, which were in prime condition. They started at 19s., and trucks having been ordered, consignments were sent away on a falling market, so that the average price realized was only 15s. 6d. Subsequently a further truck of ewes was sold off shears. They were very fat, and averaged 17s. 6d.

The 600 remaining ewes are in prime condition, and can be carried over the summer and autumn without hand-feeding.

The effect of the grass upon the wheat crop that follows it is an important point, and enough has been stated in previous reports to warn farmers that it is believed to present some difficulty in controlling on the fallow. These points, and the exact carrying capacity under controlled conditions, are now being tested at the State farms. Mr. Milbourne's crop this year is stated to average about five bags.

In conclusion, I wish the society success in its efforts to improve the farming methods of the district, and respectfully commend to its attention the valuable work which might be done by properly conducted farm competitions in raising the standard of home comforts on the farms in the district.

A fertile and prosperous district like Minyip should possess a greater proportion of up-to-date homes with gardens. A well-housed community is a contented and a permanent one, and a countryside dotted with comfortable homes nestling among shady trees lessens the lure of the city.

I have to thank the secretary, Mr. Heckle, and Mr. Wylie for their courteous assistance during the work of judging.

POULTRY PARASITES.

By A. V. D. Rentoul, N.D.D., Chief Poultry Expert, and H. F. Clinton.

External Parasites.

Domestic poultry are frequently infested with a number of species of external parasites such as lice, mites, and ticks, which by their increasing numbers and by the effects of irritation cause considerable discomfort to their unfortunate hosts. Chickens so affected mature slowly and become liable to many ailments whilst in a weak condition.

Laying hens grow thin, their egg production is reduced considerably, and the flesh of table birds becomes poor in quality. There is also every possibility of the parasites carrying and distributing disease-producing organisms. Examination of the birds themselves, and also of the sheds, for vermin is too often neglected, and the cause of the unhealthy condition of fowls is often not ascertained until after considerable loss has occurred. Prevention is always better than cure, and constant attention and cleanliness are the only means of keeping vermin in check. Houses should be regularly sprayed with kerosene emulsion or carbolic solution, and nests, perches, &c., frequently examined and treated.

Some general details are given below regarding those specimens more generally met with in domestic fowls.

Mites.

Mites belong to the group Acarina and are spider-like insects, and in the adult stage are provided with four pairs of legs. The mouth parts are adapted for piercing and sucking. Some attack the birds only at night (red mite) while others, such as scaly-leg mite, are permanent parasites.

Red Mite, *Dermanyssus gallinae*.—When full grown these mites are about one-sixteenth of an inch in length, the colour ranging from whitish-yellow to deep red when engorged with blood. They are nocturnal in their habits, attacking the birds at night and remaining during the day-time in cracks or crevices of the perches, nests, or houses. Owing to their habits they frequently escape observation, although their presence causes the birds considerable irritation and consequent loss of sleep. The ova are deposited in the hiding places of the mites and hatch out in from five to seven days, several generations occurring during the season. Although not hard to kill, great difficulty is often experienced in getting at their hiding places, consequently sheds, perches, &c., should be as free from cracks, &c., as possible. Spraying should be thoroughly done by means of a well-penetrating fine-mist spray.

Scaly Leg Mite, *Sarcoptes mutans*.—These mites live and multiply under the epidermic scales of the legs and feet, and soon set up an irritation that causes the scales to lift up and separate. Rough crusts are formed, becoming larger as the mites multiply and gradually the feet present a deformed appearance, which, if neglected, will ultimately cause lameness, and it will be only with difficulty that the bird will be able to perch. The mites may be so readily transferred from one bird

to another that prompt treatment is imperative. The crusts may be softened by a soaking in warm soapy water, and the scales removed by scrubbing with a nail brush, care being taken that bleeding does not ensue. One of various ointments, such as sulphur and lard, kerosene and lard, or carbolized vaseline, may subsequently be applied, the treatment to be repeated after a lapse of three or four days.

Depluming Scabies, *Sarcoptes laevis.*—This parasite usually commences on the rump and spreads to the neighbouring parts. It is transmitted from one bird to another and its presence may be easily recognised by the scanty and miserable condition of the plumage. Affected birds should be isolated and given a dressing of sulphur ointment.

Lice.

Unlike mites and ticks, lice live permanently on their hosts and if allowed to increase, cause considerable itching to the birds. They belong to the group termed *Mallophaga*, the members of which are provided with mouth parts fitted for biting the feathers and scales of the skin; they are quite distinct from the sucking lice which attack animals Lice breed rapidly, the eggs (or nits) being laid on the feathers, and they hatch out in from seven to ten days.

Amongst various remedies for destroying lice, dipping the bird in sheep dip or other solutions containing carbolic acid has been recommended, but this method requires to be quickly and carefully done, as the effect on the bird is rather severe. The best and most natural remedy for keeping these parasites in check is to provide the birds with a dust bath, consisting of fine dust, sand, wood ashes, and flowers of sulphur. Individual birds that are badly affected may be dusted with insect powders around the vent and under the wings. The species of lice most commonly met with are as follows:—

Menopon pallidum, the small body louse. This species is the commonest and most injurious louse found on the fowl. It is of a pale yellow colour and is about one-sixteenth of an inch long.

Menopon biscriatum, the large body louse. It is also a common species on both fowls and turkeys. It is somewhat similar in colour and habits to the small body louse, but is larger, and its head is more angular in front.

Lipeurus heterographus, the head louse of both fowls and chickens. It is found on the head and neck hackle and is at times very troublesome to young chickens. It is about one-twelfth of an inch long, and is grey in colour, with black markings.

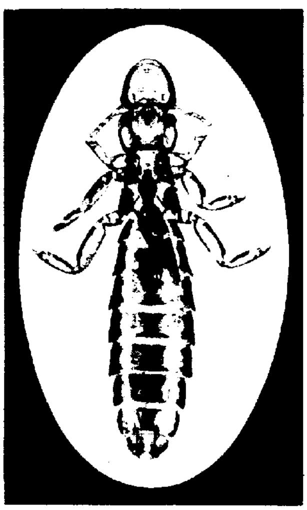
Lipeurus variabilis, the wing louse of the fowl. This species somewhat resembles the head louse in size and colour, but may be distinguished from the latter by its rounded head and narrower body. Although found mostly on the primary wing feathers, it is also found on the neck hackles and tail.

Goniodes stylifer, large turkey louse. This is often found in large numbers on various parts of the body. It is usually about an eighth of an inch long, and its colour deep brown.

Poultry Tick.

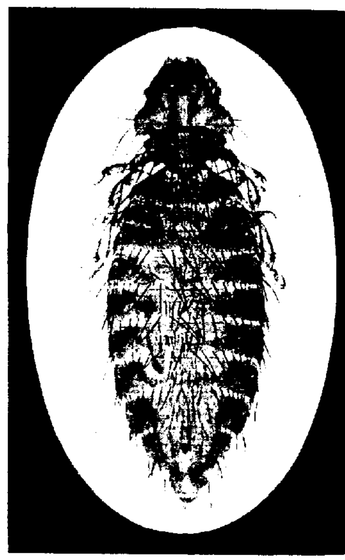
The poultry tick—*Argas persicus*—has been reported as attacking poultry from various parts of the world, including Australia, more generally in the warmer latitudes. This pest is somewhat similar in habit

to the bed bug, the adult tick hiding in crevices and cracks of the houses and perches during the day-time, visiting the birds at night in order to suck blood. They are found in all stages from the small six-legged larva, up to the adult tick with eight legs. They are oval in shape, flattened with thin margins, pitted on the dossal surface, and of a greyish-brown colour. The eyes are absent. The eggs are laid in the crevices of the houses and perches, sometimes even on the bird itself. Poultry tick are very tenacious of life, and have been known to exist for three or four years without food. When the presence of tick is suspected, a through inspection should be made underneath the perches, &c., and the blade of a knife, or chisel passed between the cracks and



Wing Louse of the Fowl.

(*Lipeurus variabilis.*)



Small Body Louse.

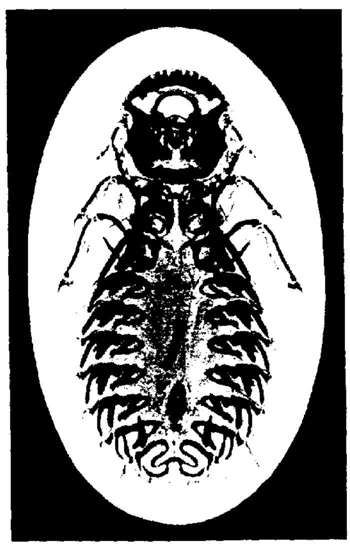
(*Menopon pallidum.*)

(Both very highly magnified.)

crevices. When tick are present the knife or chisel will come out smeared with blood. The Quarantine Act requires that all outbreaks be reported at once to the Chief Veterinary Officer, Department of Agriculture, Melbourne. In tick-infested areas all fowl houses should be constructed of iron with the woodwork on the outside if possible, and they should be built well away from any other structures. Pepper trees with their loose bark are found to harbor large numbers of these pests.

Poultry tick is responsible for the transmission of *Spirochaetosis*, or tick fever in fowls; the presence of the blood organism causing this disease is determined by microscopical examination. According to Dr. Pearl, the disease has not yet been reported in the United States, although known in South America and other countries.

The symptons of the disease are—general dullness, loss of appetite and thirst; the birds stand with head and tail down and eyes closed, and a rise of temperature takes place; diarrhoea is present, and pronounced anæmia. *Post-mortem* examination shows enlargement of the liver and spleen. The crisis of the disease occurs on the fourth or fifth day. In fatal cases the fever disappears and the temperature sinks to below normal shortly before death. The disease is caused by a spirochaete (*Spirochæta gallinarum*), found in the blood, the liver and the spleen. According to Levaditi and Manouelian a favorable turn at the crisis of the disease is brought about by the destruction of the parasites by the large leucocytes of the spleen and liver.



Goniocotes gigas (Very highly magnified.)

This parasite is not common, and is reproduced only because of its striking difference from those illustrated on the opposite page.

The organisms are carried from one fowl to another by the tick Argas. According to von Prowazek, the tick is a true intermediary host, the organisms appearing in the salivary glands about fourteen days after infection. The organism may live in the body of the tick for seven or eight months. That the tick is not a necessary host is shown by the fact that injection of the blood of an affected fowl can produce the disease in a healthy fowl.

Internal Parasites of Poultry.

GAPE WORM—*Syngamus trachealis*. The worm is at times called the Y or forked worm. The mouth parts are surrounded by a capsular arrangement with which they attach themselves firmly to the trachea (or wind pipe). The mouth parts are provided with chitinous teeth,

with which they wound the mucous membrane, and from this wound they suck blood. The female produces eggs which escape from her body and the embryos are taken up by earth worms. Chickens drinking contaminated water or eating the infected worms are in turn affected. The embryos migrate to the air passages and grow to maturity.

Symptoms.—Birds find difficulty in breathing and after a time gasp for breath, extending the head high into the air.

Treatment.—A feather dipped in turpentine may be pushed down the trachea and should be twisted round a few times before being withdrawn. Another method is to put the birds in a box and then blow lime into the box. The birds will be partially choked and cough up the worm. The box should afterwards be burned.

Tape Worms.

Tape worms require an intermediate host such as an angle worm, snail, or insect. The anterior end of the tape worm possesses a number of hooks or suckers by which it attaches itself to the walls of the intestine. Behind this head the entire animal consists of a long series of segments. The segments nearest the head are the smallest and it is at this region that new segments are constantly being formed. The farther they are from the head the larger the segments become. Towards the posterior end of the worm the segments develop sexual organs and later become filled with eggs.

As soon as the eggs are fertilized and mature, the segment containing them drops off, and is voided with the fæces of the host. Each segment of this kind contain thousands of eggs. If they are to develop further, they must be swallowed by some intermediate host, such as a worm, snail, or insect. The egg then hatches a six-hooked embryo which bores its way from the intestine into the body cavity of the intermediate host. It here develops into a larval form known as a cysticercoid.

When the intermediate host is eaten by a chicken, the larva continues its development and forms the adult tape worm. Epsom salts and oil of turpentine are an excellent remedy, but care must be exercised to ascertain that the "head" of the worm is voided, and the excreta should be carefully burned.

Round Worms.

These are far more common than many people have any idea of, and when numerous in any bird, they affect digestion and lessen nutrition, whilst by irritation of the intestine they cause stubborn diarrhoea. Ova, microscopic in size, pass from the fowl to the ground, and other birds become affected by drinking or eating in places soiled with the excrement of affected birds. The symptoms are general lassitude with emaciation, and at times ravenous appetite.

Treatment.—Keep yards and house clean, lime the floors and yards and disinfect food troughs, and water vessels daily. Five to ten grain doses of areca nut may be mixed with the soft food, and will act as a cathartic as well as a parasiticide. One grain doses of thymol or two grain doses of santonin have also proved effective in ridding the birds of worms.

FARM NOTES FOR APRIL, 1920.

STATE RESEARCH FARM, WERRIBEE.

H. C. Wilson, Manager.

The Season.

In common with most other agricultural districts of this State, Werribee is suffering from a very dry seeding season. The rainfall for the first four months of this year has been as under:—

January	125 points.
February	30 points.
March	77 points.
April (light rain recorded on 14 days of this month)	126 points.
Total	358 points.

There has been insufficient rain to date to start any of the native root-grass pastures, and, in consequence, stock are being maintained mainly by hand feeding and grazing on irrigated lucerne and grass areas. The stubbles for the sheep, which were light this year, have been stocked heavily and eaten out. These areas, in a normal season, would have been sufficient to maintain the 650 flock ewes, which are now lambing; but it has been found necessary to use portion of our irrigated areas to supplement the grazing of the stubbles. Good soaking rain is badly needed, both for insurance of a fair seeding season, and future stock prospects.

Seeding.

Cultivation of the fallows of the farm, some 650 acres in extent, was proceeded with through the months of January, February, and March, and this month 300 acres were sown with shandy hay, as follows:—45 lbs. of Yandilla King graded seed wheat, mixed with 1 bushel of Algerian oats, together with 120 lbs. of superphosphate per acre. Heavy harrows preceded and followed the drills during these operations, and the fields are now being rolled to ensure an even surface for the binder at harvest time. The germination to date of the earliest of these areas is very unsatisfactory, green patches only showing above the surface. Some fear is felt for the wheat in this mixture, as in previous years partial failure has resulted through malting and mould under these conditions. This is not the case with the oats, as they undoubtedly seem to be more resistant to malting or mould. This, it is claimed, is one of the great advantages of sowing the shandy mixture for hay. If the wheat partly fails, the resultant crop will have a greater proportion of oats than would have resulted under good conditions; but the crop will not prove by any means the failure that would have been the case had wheat been sown alone as a hay crop. Shandy mixture for hay proves to be a very valuable balanced ration for horses or dairy herds, and is relished much more than either of these two cereals sown separately as hay. Sixty acres of oats for seed have also been sown on fallow, but no germination is yet noticeable.

On the 27th of May, a start was made in sowing our seed-wheat areas and wheat experimental plots on well-prepared fallows. This

is the critical time with us, as we are solely dependent on the rainfall, and to insure a good germination a fall during the first fortnight of May is essential. The fallowed areas, though very fine in texture, are exceptionally dry, and the seed-wheat is being pickled with ½ per cent. solution of formalin, and allowed to dry thoroughly before sowing. Care is being taken by the drill operators to plant as close to the surface as possible, so that the possibilities of serious malting before rain falls will be minimized. Sixty-five pounds of late wheats, such as Yandilla King and Warden, are now being sown with 120 lbs. superphosphate per acre. It has been found necessary in past years to sow these late wheats early with heavy dressings of seed to obtain the best results. Such wheats as Federation, Gallipoli, Currawa, Major, Marshall's No. 3 —known as midseason's wheats—will be sown next with 60 lbs. of seed and 120 lbs. of superphosphate per acre.

Rape.

A field of 60 acres of rape, sown early in the month as a catch crop on land which was intended as a fallow this season, has not proved to be the success that was anticipated. Owing to the dryness of the autumn, the germination was rather poor, and success, in a measure, depends upon a quick germination and growth of the crop in the early autumn months. However, it has been our practice in the past to re-seed these rape fallow areas in August if the autumn crop proves to be a failure. This has been done in past years with rather marked success. Four pounds of Dwarf Essex rape, and 56 lbs. of superphosphate, is sown to the acre, care being taken not to leave the seed mixed with the fertilizer any longer than is absolutely necessary, as the germinating power of the rape will be affected by long contact.

During late March and early April, 200 acres of stubble land were ploughed and worked down in preparation for seeding Cape barley. These fields will be left until rains fall and weeds have germinated, and then finally worked with disc-cultivators, and sown in June with 65 lbs. barley, and 1 cwt. superphosphate per acre.

Barley-growing in this district has proved to be profitable, and it is the only grain crop that seems to give payable results when sown on ground which has not been fallowed, and which has carried a crop of wheat or hay the previous year. An effort is being made this season to sow areas of pure-seed barleys, both of the feed and malting varieties, on clean land. If successful, the resulting seed will be available for distribution next season.

Lucerne Harvesting.

The lateness of the lucerne harvesting has been phenomenal this season. First-quality lucerne hay has been harvested throughout the month; while the last of our areas are now being cut, and promise, even at this late stage, to yield up to a ton per acre. The growth on the irrigated fields, owing to the dryness and warmth of the autumn, has been exceptionally good, and the harvesting has been extended some weeks longer than has been our custom since the inception of the farm. With a view to ascertaining the loss of weight in a stack of lucerne hay, weighings have been made during the month which prove that if the lucerne, when stacked, contains the right quantity of moisture to insure its thorough curing, very little loss occurs through stacking.

Fifty-one tons of lucerne hay, with a moisture content of approximately 18 per cent., were stacked at the farm during the month of November. Four months later, it was baled, and again weighed. The total loss of weight was 1 ton 6 cwt. Some part of this loss, of course, may be credited to baling operations, and approximately 2½ per cent. loss of weight can be reckoned on after four months in the stack.

Live Stock.

In view of the Royal Agricultural Society's efforts to organize a show of live stock during the middle of May in honour of His Highness the Prince of Wales, efforts are being made on the farm to get into show condition representatives of the different sections of Red Poll and Friesian cattle, Clydesdale horses, Suffolk and Border Leicester sheep that were successful at the last Royal Show.

Horses.—Owing to a large number of young Clydesdale fillies and geldings, which are a result of our stud breeding here, we are now heavily stocked; there are 108 head of all ages. Of these, 25 yearlings

A 104-ton Stack of Lucerne at State Research Farm, Werribee.
(Built this Season.)

by the Clydesdale stallion Major Oates, and 18 foals by the Clydesdale stallion Baron Wigton, are being grazed on the irrigated areas; while 10 rising three-year-olds are about to be handled and broken in for work during the seeding. This heavy stocking is taxing the resources of the farm in such a dry season, but there is no scarcity of fodder reserves. The cost of feeding working horses at the present time, allowing for the actual value of the food on the farm, is, approximately, £1 per head per week. This allows a ration of 30 lbs. of sheaf chaff, 7 lbs. lucerne chaff per diem, and on this amount heavy draught horses in full work will maintain their condition if driven by careful drivers, and shown other necessary attention.

Cattle.—Forty-eight Red Polled and 6 Friesian are now being milked in the dairy. The milk yield averages, approximately, 140 gallons per day. This includes the yield of heifers and cows that are being dried off. The ration of the herd consists of 14 lbs. of lucerne and barley silage, 12 lbs. of lucerne hay, and 8 lbs. of bran per day per cow. In

addition to this, the cows are grazed on irrigated lucerne for upwards of two hours daily. There are also on the farm 16 young and 4 aged bulls, 14 heifers, and 10 dry cows, giving a total, with milkers, of 104 head. The health of the whole dairy herd has been excellent during the month, and the milk yields have not appreciably lowered through the approaching winter.

Suffolk Cross Lambs, Dressed.

Sheep.—The number of sheep carried on the farm is as follows:

Merino Lincoln cross 4-year-old ewes, now lambing to Suffolk and Border Leicester rams	640
Suffolk cross weaners	30
Suffolk stud	80
Border Leicester stud	260
Mixed sheep for rations	20
Total	1,030

With a view to the production of suitable fat lambs for the early markets, 8 Suffolks and 8 Border Leicester two-tooth rams were joined with 600 four-year-old Merino Lincoln ewes in the first week of November last year. The ewes are now lambing fast, and, fortunately,

we are in a position, owing to our irrigated areas, to maintain them in the condition that is necessary to enable them to suckle their lambs well. If these lambs thrive as expected, we shall have the first truck available for market towards the end of July, when there will be very few of this season's lambs offering for sale. This early lambing can be practised with success only where there are good prospects of succulent feed, either natural or under irrigated conditions, available for the ewes from the month of April onwards.

Proposed Work for the Month of May.

1. Seeding proceeded with, mainly wheat and oats.
2. Rolling sown fields, and preparation for binder.
3. Cultivation of areas green ploughed in the months of March and April, in preparation for barley seeding, when the season takes a favorable turn.
4. Ploughing 200-acre field to be treated as a rape fallow.
5. Maintenance of farming routine and improvement work.
6. Attention to stock and dairy herds.
7. Seeding experimental fields.
8. Completion of lucerne hay harvesting.
9. Channelling new area of 80 acres sown to lucerne.
10. Cultivation before and after drills throughout the seeding.

NOTES ON EXPERIMENTAL WORK, MARCH, 1920.

George S. Gordon, Field Officer.

SEASONAL CONDITIONS.

The dry weather experienced in February was continued in March. Only 77 points of rain were recorded for the month. This amount was made up of seven small showers, the heaviest of which registered only 37 points. Consequently, the rain was of little use to growing crops, or for obtaining a quick start for early-sown seed.

EARLY SEEDING.

In view of the large amount of seeding to be got through on the experimental areas this year, it was considered advisable to commence sowing in spite of the dry autumn. In the green manurial field, the rape, barley, and oat plots for feeding off and ploughing in, and the rape, pasture, and hay plots in the permanent rotation field have been sown. A mixed crop of Algerian oats and dun peas has also been seeded in the section of the manurial field which was under wheat last year. Although in the manurial field these plots were sown without fertilizers in order to obtain further definite information regarding the availability of the fertilizers to crops succeeding those to which they were applied, the change of crop to oats and peas will also serve as a rotation or suitable break in the wheat crops which have been treated with various fertilizers, and sown in alternate years on bare fallow. Despite careful fallowing, early sowing under dry conditions generally leads to more or less "dirty" crops; this is because there is not sufficient moisture in the immediate surface to germinate such seeds as those of cape weed, &c., until the rain occurs, which also germinates the seed of the sown crop. Both crop and weeds then start into growth at the same time.

and the judicious use of a light harrow is necessary to check the growth of the latter. On the other hand, when late summer rains have fallen, or the autumn "break up" occurs early enough to germinate the seeds and permit of the young weeds being killed by cultivation prior to seeding, clean crops result.

Early crops have the following advantages over late ones:—

1. The early growth is much more vigorous and rapid because the soil still retains some of the summer warmth.
2. By the time the cold of winter comes on, the plants have their roots well down in the warmer layers of the subsoil, and are, therefore, better able to stand frosts and cold wet weather than late crops, which are then struggling to grow in the cold surface soil.
3. The longer growing period, and consequently better root development, enables the plant to obtain more moisture and plant food during the ripening period of the succeeding summer.
4. Early crops may often be grazed with advantage when the ordinary pasture is scarce. If the season has induced such a rank growth that there is a possibility of "lodging," or the crop is so forward as to be in danger from late frosts, this is the best method of checking it.

The "Best" Agricultural Practice at Werribee.

In view of the urgent necessity for increasing production, and to meet inquiries for concise information as to which is the "best" variety, "best" manure, &c., as shown by the results obtained from the experimental plots at Werribee, these points are briefly summarized below. It is not suggested that these results are necessarily applicable to the whole of Victoria without modification to suit local conditions, but there is no doubt they do apply to a large portion, and are of value, in a comparative sense, to the whole State.

1. The best varieties of wheat during the past five seasons at Werribee were—

   (*a*) Gallipoli (new crossbred 4071, Club x Yandilla King).
   (*b*) Marshalls No. 3.
   (*c*) Graham (new crossbred, Indian x Comeback).
   (*d*) Major.
   (*e*) Currawa.
   (*f*) Yandilla King.
   (*g*) Federation.
   (*h*) Warden (the best hay variety).

2. The best varieties of barley were—

   (*a*) Roseworthy Oregon } Six-rowed or feed types.
   (*b*) Cape }
   (*c*) Pryor (the best two-rowed or English malting type).

3. The best variety of oats was—

   Algerian.

4. The best manure was—

   Superphosphate.

5. The best quantity of superphosphate to apply was—140 lbs. per acre.

6. The best time to sow was—
   (*a*) Oats, early (March and April).
   (*b*) Wheat, early (May).
   (*c*) Barley (May and early June).

   NOTE.—Late (or slow maturing) varieties should be sown first. Early (or quick maturing) varieties should be sown last. Hence barley, being a quick-growing cereal, is the last to be sown.

7. The best results have been obtained from plump-graded seed of first quality. The quantity to sow varies somewhat with the variety, purpose for which the crop is intended, season, and time of sowing. The earlier the sowing the less seed is required, providing the seed bed is clean.

NOTES ON EXPERIMENTAL WORK, APRIL, 1920.

Plant Breeding.

The final laboratory examination of the plants which were roughly selected in the field before harvest has been completed, and those selected for further trial have been individually recorded, thrashed, and prepared for sowing. A representative head from each selected plant has been kept for reference, and as an insurance against possible failure of the seed to be sown. The plants retained for sowing comprise crossbreds, and selections from standard varieties of wheat, barley, oats, and flax; and this year the number runs into larger figures than usual. These may be summarized as follows:—

			Plots.
A.—Standard varieties of	wheat	180	
„ „	barley	40	
„ „	oats	25	
„ „	rye	1	
			246
B.—First generation crosses, made during 1919 (wheat, barley, oats, and rye)		83	83
C. Wheat, second generation crossbreds	..	88	
„ third „ „	..	1,389	
„ fourth „ „	..	285	
„ fifth „ „	..	64	
			1,826
D.—Barley, second generation crossbreds	..	99	
„ third „ „	..	342	
„ fourth „ „	..	20	
			461
E. Oats, third, fourth, and fifth generation crossbreds	..	37	37
F. Gallipoli, and other wheat selections	..	197	197
G.—Flax selections for fibre and seed ..	..	154	154
	Total		3,004

In addition to these, a number of drought-resistant varieties collected in Palestine by Major Cherry, promising crossbreds from South Australia, and rust-resistant varieties from America, will be sown. The whole of these plots will be sown by hand, and will cover an area of about 9 acres. The grain is dropped at ½-link spaces, in rows 4 links apart, with check rows of Federation, or other suitable standard varieties, in every tenth row for comparison of growth and yield. Selections from the third, fourth, and fifth generations, which are "fixed," or true to type, and compare favorably with the check rows, are grown in larger plots, known as "Long Rows," in the succeeding year. Over 400 such crossbreds and selections have survived the test in last year's plots, and the seed from these has been graded and prepared for sowing in this year's "Long Row" section.

FOX GUARDS FOR SHEEP.

By H. W. Ham.

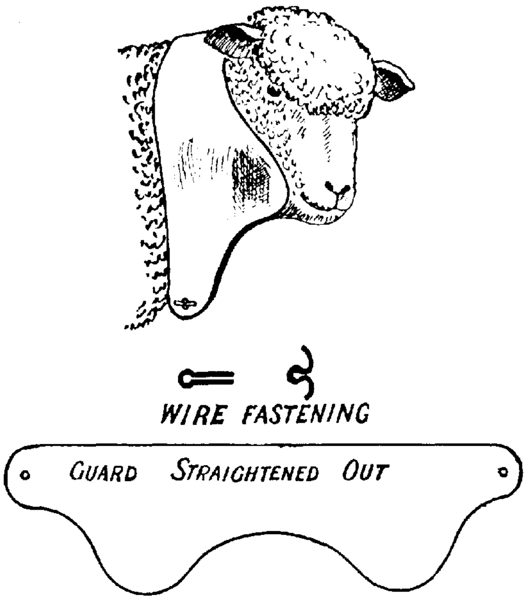
In most flocks the loss of a percentage of lambs must be looked for as the result of inward defects and malformations, but probably more are lost through the ravages of foxes. Very close observation is necessary, as a rule, for a farmer to make sure that foxes are attacking his lambs, for the habitual lamb-killing fox does his work so neatly and cleanly that it is only by close inspection that the fang marks can be noticed through the short wool of the dead lambs. The surest method of proving whether a lamb has been killed by a fox is to open the skin at the neck close to the head, and if the punctures can be seen on each side of the throat, through the jugular vein, the owner can be assured that it is the work of a fox. The flesh of lambs killed in this way will usually be quite white and clean.

The method of the most cunning dog foxes is to move about the ewes until a lamb is found sleeping, or until one, awaking suddenly, runs towards the fox, as they sometimes will towards a horseman or shepherd, or other moving object.

Foxes have been seen in the early morning tossing a lamb over and gripping it close to the jaws underneath close up to the ears (not over the back of the neck as many suppose). One full-blooded lamb will often satisfy a fox, but occasionally he will kill two. When the lambs become stronger they will sometimes fight themselves free, and perhaps be found next morning showing signs of their struggle on the nose and throat.

The guard illustrated has been designed to protect young lambs. It will cover the vital parts around the neck, and yet allow the lamb to raise its head to suck and to lower it to eat grass. Guards of this pattern may be cut from pieces of tin, and should be made in varying sizes—the smaller for Merinos and larger for Lincolns or Border Leicesters. They should be cut about 2 inches wide at the back of the neck on top, and 3 inches or a little more below. A guard may be

fastened together with fine wire, made in the form of a staple, which, when placed in position, should be turned up after the manner of staples in fencing droppers. If a certain gauge of copper wire be used, it will



FOX GUARDS

be found in cases of rapid growth of a lamb to pull out gradually, and the collar will then drop off. It is, however, preferable to remove them after six or eight weeks, and put them by for use again.

PLANTING AND RECONSTITUTION OF VINEYARDS.

Conditions Governing the Distribution of Phylloxera-Resistant Vine Rootlings and Cuttings.

The conditions subject to which Victorian vine-growers may purchase phylloxera-resistant vine cuttings and rootlings (grafted and ungrafted) from the State Vine Nursery, at Wahgunyah, have been drawn up for the current year, and copies of same will shortly be available on application.

The price at which these vines will be supplied has been recently considered by Cabinet, and the Government has decided to make an increase on last year's prices as specified below.

As regards the grafted rootlings, the increased price will only apply to the 1921 delivery; there will be no alteration for those to be delivered during the coming winter, for which contracts were entered into before 30th June last.

The increase will, however, apply to ungrafted rootlings and cuttings for delivery during the coming season.

It is felt that growers will realize that the increase is reasonable, if only on account of the higher cost of everything used in connexion with the Nursery, and the consequent increase in the expenditure necessary to continue the subsidy to the industry which is involved in the scheme for the supplying of phylloxera-resistant rootlings. Since 1914, when prices were last fixed, wages for casual labourers have increased from 7s. to 10s. per day.

Even at the increased price, vines are being supplied to intending planters at considerably below the cost of production.

In other respects, with the exception of the necessary corrections of dates (substitution of 1920 for 1919, &c.), no alterations have been made.

The time within which applications will be received remains as it was last year, as will be seen below. Applicants are required to finally decide, when filling in their application forms, as to their stock and scion requirements; no amendment can be permitted later.

It will suffice here to explain that resistant vines are supplied to intending planters in any of the following forms, and at the prices stated; packing extra in the case of consignments forwarded by rail:—

Resistant rootlings, grafted with scions previously supplied by applicants, at per 1,000, £9.
Resistant rootlings, ungrafted, at per 1,000, £2.
Resistant cuttings, at per 1,000, £1.

APPLICATION FORMS.

No application will be entertained unless made on the forms supplied for the purpose, which are obtainable from the Director, Department of Agriculture, Melbourne, or from the Principal, Viticultural College, Rutherglen.

Separate forms are provided for (*a*) Grafted Rootlings (green form); (*b*) Ungrafted Rootlings and Cuttings (yellow form). Applications must be filled in on the proper forms.

Each applicant for forms will be supplied with a copy of the detailed conditions governing the distribution of phylloxera-resistant vine rootlings and cuttings.

Applicants are earnestly requested to thoroughly familiarize themselves with these. *They are warned that under no circumstances can any departure be permitted from the regulations governing the distribution as detailed therein, nor can any request for special consideration be entertained.*

DATES BEFORE WHICH APPLICATIONS MUST BE MADE.

For Grafted Rootlings (1921 distribution, June to August inclusive), applications will be received until 30th June next. (For the 1920 distribution the time for receiving applications closed on 30th June, 1919, and present applicants cannot be supplied until 1921.)

For Ungrafted Rootlings, to be distributed from July to August, 1920, inclusive, applications will be received until 31st July, 1920.

For Cuttings (see conditions), applications will be received until 30th June, 1920.

SUPPLYING CLEAN DISTRICTS.

The nurseries in which grafted rootlings are raised being situated in phylloxerated districts, these cannot be supplied to growers in clean districts. To do so would be manifestly unfair to owners of existing vineyards in such districts.

A limited number of clean resistant cuttings are, however, available, and these can be supplied to applicants from clean districts.

RAINFALL IN VICTORIA.

First Quarter, 1920.

District.	—	January.	February.	March.	Quarter.
		Points.	Points.	Points.	Points.
Mallee North ...	Mean	15	10	14	39
	Normal ...	65	86	98	249
	Per cent. Departure ...	−77	−88	−86	−84
Mallee South ...	Mean ...	7	1	17	25
	Normal ..	59	93	96	248
	Per cent Departure	−88	−99	−82	−90
North Wimmera ...	Mean ...	10	2	72	84
	Normal	56	90	103	249
	Per cent. Departure	−82	−98	−30	−66
South Wimmera ..	Mean	17	6	99	122
	Normal ..	74	87	110	271
	Per cent. Departure	−77	−93	−10	−55
Lower Northern Country	Mean ..	12	0	18	30
	Normal ...	95	93	118	306
	Per cent. Departure	−87	−100	−85	−90
Upper Northern Country	Mean ..	19	1	27	47
	Normal ...	116	102	138	356
	Per cent. Departure	−84	−99	−80	−87
Lower North-East ...	Mean ...	51	3	115	169
	Normal ..	157	143	220	520
	Per cent. Departure ..	−68	−98	−48	−68
Upper North-East ..	Mean ...	163	1	296	460
	Normal ..	230	194	277	701
	Per cent. Departure ..	−29	99	+7	−34
East Gippsland ...	Mean ...	856	31	250	1,137
	Normal ..	269	217	255	741
	Per cent. Departure ..	218	86	−2	+53

Rainfall in Victoria—*continued.*

District.	—	January.	February.	March.	Quarter.
		Points.	Points.	Points.	Points.
West Gippsland	Mean	174	68	305	547
	Normal	226	168	284	678
	Per cent. Departure	-23	-60	+7	-19
East Central	Mean	97	91	280	468
	Normal	251	157	279	687
	Per cent. Departure	-61	-42	0	-32
West Central	Mean	79	24	114	217
	Normal	130	125	213	468
	Per cent. Departure	-39	-81	46	54
North Central	Mean	52	14	61	127
	Normal	128	134	181	443
	Per cent. Departure	-59	-90	-66	-71
Volcanic Plains	Mean	40	27	157	224
	Normal	121	115	178	414
	Per cent. Departure	-67	-77	-12	-46
West Coast	Mean	59	64	245	368
	Normal	132	126	195	453
	Per cent. Departure	-55	-49	+26	-19

N.B.—100 points = 1 inch.

H. A. HUNT,
Commonwealth Meteorologist.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

Cultivation.

Cultivation work should be well on the way by this time. The ploughing should be advanced, so as to leave plenty of time for other orchard work. Autumn ploughing may be rough, but care should be taken to plough to the trees, so that a drainage furrow is left between the rows.

Manuring.

It is just possible, where heavy crops have been carried, that a top dressing of stable manure will be required to add humus to the soil. The fertility of the soil must be maintained; and, although stable and chemical manures as a general rule are of undoubted value as tree stimulants, well-cultivated and thoroughly tilled land will always carry fair crops with far less manure. Further, if the orchard land is well drained, cultivated, and sub-soiled, any manures that are used will be far more beneficial to the trees. The more suitable the conditions that are given to the trees, the better they can appreciate and assimilate their food.

Perhaps the most useful and valuable of manures is stable manure. It is of great use, not only as a manure and as an introducer of necessary bacteria into the soil, but its value in adding humus to the soil is incalculable. Organic matter, such as stable manure, introduced into the soil quickly becomes humus; this greatly ameliorates and improves soil conditions. It is impossible to say what quantity of stable manure is necessary per acre; that can be determined only by circumstances. Orchards in different climates and varying soils will require differing quantities. A too liberal use of stable manure will be over-stimulating in most cases, and at all times an excess beyond what is necessary for present use will only be waste, as humus is readily lost from the soil, once it is in an available food form.

It has been pointed out in these notes previously that an improved physical condition is far more profitable to the fruit-grower than the continued use of manures. A tree will be far more productive if it is happy in its soil conditions; uncomfortable conditions will always result in unprosperous trees.

A dressing of lime, using about 4 or 5 cwt. per acre, is of great value in stiff or heavy orchard lands; and it may be given at this season. The lime, which must be fresh, should be distributed in small heaps between the trees, covered with a layer of soil, and allowed to remain for a few days before ploughing or harrowing in.

Pests.

The advice given last month for spraying should be followed, particularly where any oil emulsions or washes are to be used.

Orchards will benefit if an attack is now made upon the Codlin moth. All hiding places, nooks, and crannies, where the larvæ have hidden, should be thoroughly searched and cleaned out. The orchardist has far more time now to do this work than he will have in the spring time.

General Work.

Drainage systems should now be extended with as little loss of time as possible.

New planting areas should be prepared, and subsoiled or trenched wherever possible.

Vegetable Garden.

Weeds must be kept down in the vegetable garden. Weeds are generally free growing at this season; their growth is very insidious, and they will crowd out the young seedlings or plants in a very quick time. Hoeing and hand weeding must be resorted to, preferably hoeing. The frequent use of the hoe in winter time is of much benefit in the vegetable garden. A varied assortment of crops is now being produced; and if these can be kept growing much better crops will result. The soil quickly stagnates in the winter, and the only way to prevent this is to keep the surface stirred. Thus, a double service is performed with the aid of the hoe.

The application of lime is of great necessity at this season. In addition to amending unhealthy and unsuitable soil conditions, lime is particularly useful as an insecticide. It assists in destroying in immense numbers both eggs and insects that would breed and live in the ground ready to do damage to all classes of vegetable crops. Therefore, wherever possible, the soil should receive an application of lime. The garden should, as well, be manured with stable manure, but not for some weeks after the lime application.

Cabbage and cauliflower plants may be planted out; and seeds of parsnips, carrots, onions, peas, and broad beans may be sown.

Flower Garden.

The whole flower section should now be thoroughly dug over. All beds should be cleaned up, top-dressed with manure, and well dug. The light rubbish, such as foliage, twiggy growths, weeds, &c., may all be dug in, and they will thus form a useful addition to the soil. These should never be wasted. Only the coarser and stouter growths should be carted away for burning, and then the ashes may be used as manure. No part, whatever, of garden rubbish or litter need be wasted. In one form or another it should be replaced in the soil.

May is a good month for establishing new gardens, and for planting out. All deciduous plants and shrubs may now be planted. It is not necessary to dig a deep hole for planting. A hole in which the roots of the plant can be comfortably arranged, without crowding or cramping, will be quite sufficient for the purpose.

Continue to sow seeds of hardy annuals, including sweet peas, although the main crop of sweet peas should by this time be well above ground. Where there has been any overplanting, the young plants will readily stand transplanting, and this will greatly assist those that are to remain. Annuals should not be crowded in the beds. They require ample room for suitable development, and thus the seeds should be sown thinly or the plants set out a good distance from each other.

All herbaceous perennials that have finished blooming may now be cut down. Included amongst these are phlox, delphiniums, &c. If these are to remain in their present situation for another season it is always an advantage to raise them somewhat, by slightly lifting them with a fork, so that too much water will not settle around the crowns: they may also be mulched with stable manure, or the manure may be forked into the soil around the crowns.

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REPORT ON THE NINTH VICTORIAN EGG-LAYING COMPETITION.

1st April, 1919, to 31st March, 1920.

By A. V. D. Rintoul, N.D.D., Chief Poultry Expert.

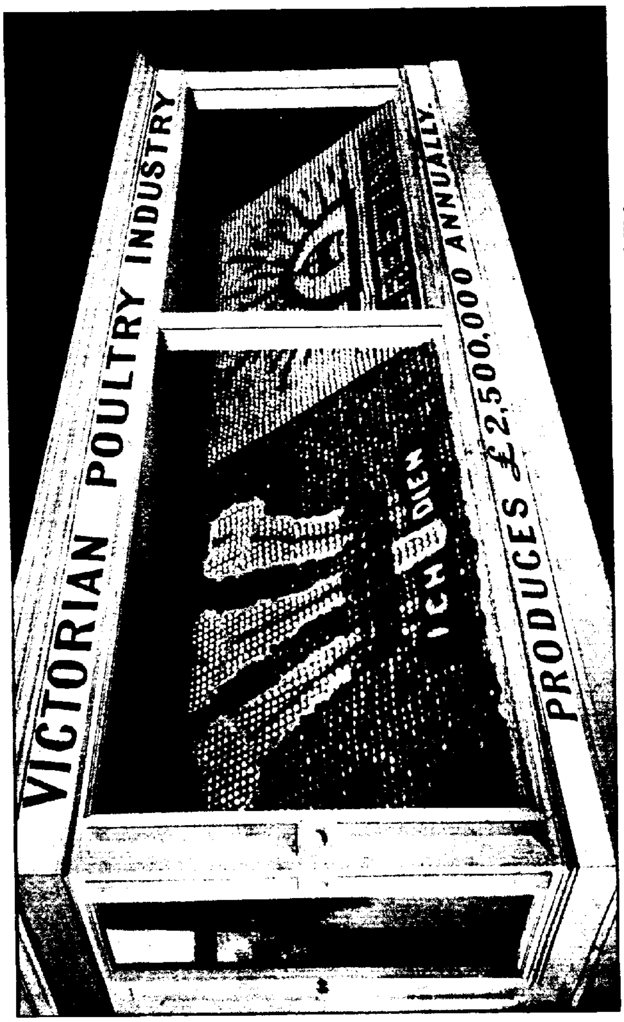
The principal feature in connexion with the above competition was the introduction of trap-nests amongst the teams of six birds. It has for some time been recognised that the aggregate score for six birds was insufficient information for the average competitor, as in saving cockerels for subsequent breeding purposes from a team of six birds, bred from as such, there always exists the danger that a son of the poorest layer might happen to be selected instead of one from the best.

Curtailment by Cabinet of the departmental vote, coupled with the very high prices prevailing for building materials, delayed the erection of additional single pens, consequently trap-nests were introduced, the trap front being designed by Mr. L. Smith, Assistant Poultry Expert, and the rest of the nest was designed by Mr. W. Rugg, who is in charge of the poultry section at the Werribee Research Farm.

Arguing from the old saying—that it is a simple matter to lead a horse to the water, but sometimes impossible to get him to drink—a few pessimists were inclined to predict disaster for the trap-nest venture, on the ground that, while trap-nests and birds could be brought together, it was not possible to force the birds to lay in the nests, and failure was, therefore, certain to arise owing to the unrecorded eggs.

Trap-nest Results.

Table I. shows the monthly results from each of the four sections—light breeds—(1) wet mash, (2) dry mash; heavy breeds—(3) wet mash, (4) dry mash. It was, of course, only to be expected with birds quite unaccustomed to trap-nests, and with the



Egg Exhibit Prepared for Show in Honour of H.R.H. the Prince of Wales.

system somewhat strange to the staff, that the results for the first month should show a fairly high percentage of eggs laid outside the traps. Mr. A. Enticknap's team of six white Leghorns, fed on the dry-mash system, out of a total of 1,573 eggs for the year laid only two outside the traps, one of these being laid during the first week of the competition. On the other hand, Mr. R. E. Exelby's white Leghorns, on wet mash, laid 272 (out of a total of 1,107 eggs) outside the nests.

During the season 1907-8, at the Maine, United States of America, Experimental Station, Dr. Raymond Pearl had, out of a grand total of 58,374 eggs, an average of 4.01 per cent. laid outside the traps, this being the first season the method was adopted. The Burnley figures for last year show an average of 3.29 per cent. eggs laid outside the traps.

Dr. Pearl, in his report, writes as follows:—"All experimental studies of any magnitude of fecundity in the domestic fowl must rest ultimately upon trap-nest records. In spite of the fact that so much trap-nesting work has been done in the various experimental stations, there has never been any careful study, so far as the writer is aware, of what may be termed the residual error of trap-nest records. By residual error is meant that error which remains after all instrumental sources of error, such as, for example, failure of a nest to operate owing to its being out of repair, have been eliminated. It will always be the case that some birds will at some times lay outside the trap-nest. The important point to any one concerned in the accuracy of the records relates to the amount of this error."

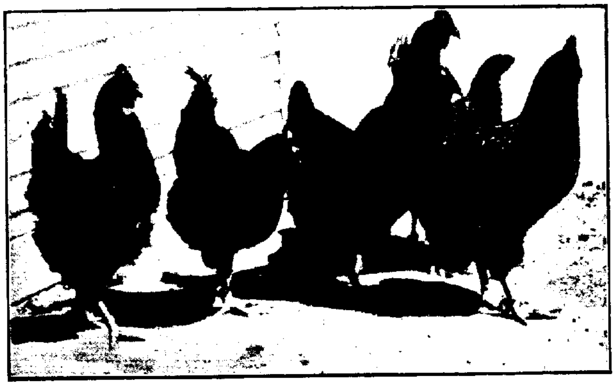
Greater Accuracy in Single Pens.

Twelve years ago, the advent of the single-test pen was hardly looked for, and probably only single-test pens would now be used at Burnley but for the expense of erection; at the same time, however, the enormous value of accurate records to the poultry industry is well-nigh incalculable, and it is desirable, if possible, to eliminate even such a small margin of error as 3.29 per cent., absolute accuracy being only possible in the single-test pen.

Once more, however, let it be impressed upon breeders that, for breeding purposes, figures alone must not be relied upon. *The first essential is a sound and vigorous constitution*, and is of far greater importance in establishing a flock than a mere matter of some eighteen or twenty eggs. I have personally seen at laying competitions birds which laid upwards of 300 eggs in a year, but, except for colour, they had no claim to the breed under which they were entered, and others that were too weak constitutionally to be considered suitable breeders.

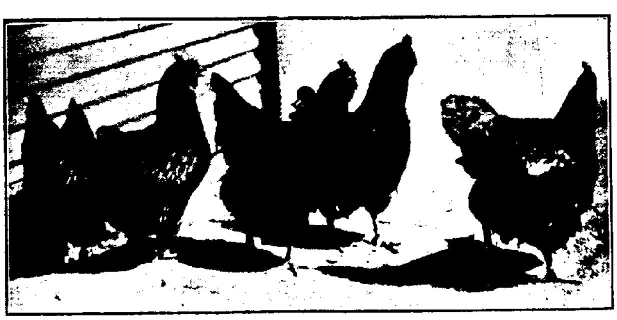
Competition Results.

Analyzing the results, we find that the highest scores in the competition are from the trap-nests, and not from the single pens. Mr. P. N. Tilley's white Leghorn No. 1 laid 312 eggs in the traps; whereas the highest score in the single test was Mr. Jack Ryan's white Leghorn (dry mash), 303. In heavy breeds, Mr. C. E. Graham's black Orpington No. 2 was trap-nested to lay 290 eggs, while Mr. G. H. O'Bree's Rhode Island red laid 287 in a single-test pen. On the other hand, the average number of eggs laid per bird in the trap-nest section is 206, as against 212½ per bird in single test. It should be borne in mind,



Mr. J. W. Leydon's Winning Team. Heavy Breeds—Dry Mash. 1,458 eggs.

Mr. P. N. Tilley's Winning Team. Light Breeds—Wet Mash. 1,575 eggs.



Mr. S. Andrew's Winning Team of Black Orpingtons. Heavy Breeds—Wet Mash. 1,553 eggs.

however, that there were 600 birds trap-nested as against 150 single-tested; the average for all birds throughout the competition being 207½ eggs. It is also reasonable to assume that the competitors endeavoured to place their best birds in the single test, and subsequently selected the next best for trap-nests.

System of Feeding.

The most important feature is the fact that pea-meal was entirely dispensed with, not from choice, but because it was not possible to secure a continuous supply; but, notwithstanding this, the yield of eggs was well maintained during the year.

Wet Mash.—During the first six months of the year the birds fed on wet mash received the following ration:—

Wheat bran (by measure)	1½ parts
Wheat pollard (by measure)	2 parts
Oat pollard (by measure)	½ part
Chaffed greenstuff	1 part.

This mixture was moistened with soup made from livers and bullocks' heads, and a particularly good sample of bone charcoal was added at the rate of half-a-pint per 100 birds. About 2 ounces of meat to every six birds were mixed with the mash once a week, as well as raw minced onions to the extent of 2½ per cent. of the whole mash.

Evening feed consisted of the following grains:—

Wheat	3 parts
Oats	1 part
Maize (crushed)	½ part

given as a mixture (roughly, 2 ounces per bird); whilst, during the day, ample green feed was given (according to the season), such as kale, silver beet, milk thistles, lucerne, green barley, and rape. At all times shell grit, crushed oyster shells, quartz grit, and charcoal were kept before the birds.

After the first six months the wet mash was altered, and fed as follows:—

Wheat bran (by measure)	2 parts
Wheat pollard (by measure)	2½ parts
Chaffed greenstuff	1 part.

Soup, meat, onions, charcoal, and greenstuff were allowed as before. Maize was cut out of the grain mixture, which was—five nights a week—wheat only; the other two nights the meal consisted of two parts wheat and one part oats.

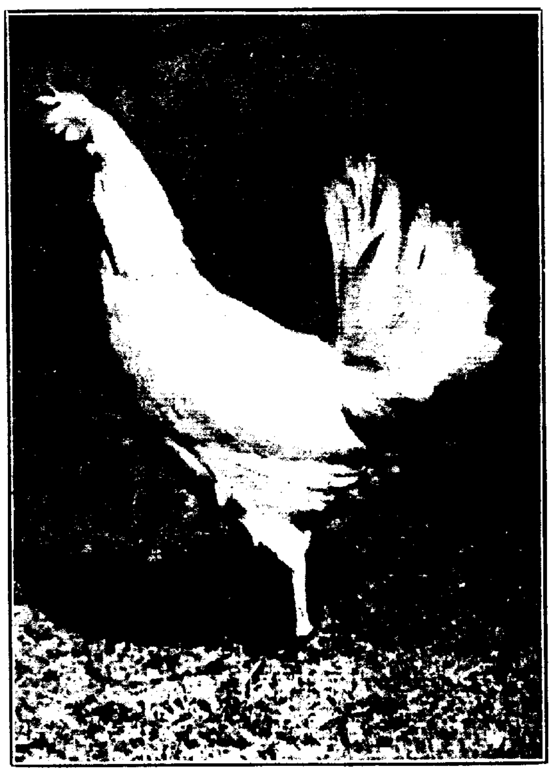
Dry Mash.—During the first six months the mixture consisted of—

Wheat bran	4 parts
Wheat pollard	3 parts
Oat pollard	1 part
Charcoal	1 per cent.

Minced liver was given in a dry condition, three times weekly, at the rate of 2 ounces to six birds, and 1 ounce of raw minced onions was fed weekly to every six birds. During cooking, a sprinkle of salt was added to the livers, which were always fed to the birds in a cooked state. Grain, greenstuff, &c., were of the same quantities as fed to

the west-mash section. It was reported in New South Wales a few years ago that the dry-mash section at Burnley received some wet mash. This was quite incorrect, as no wet mash has at any time been allowed to the dry-mash competitors.

The cost of food was approximately 2¾d. per bird per week. The various samples of foodstuffs supplied varied so much that the nutrient ratio cannot be expressed in decimal points. The generally mediocre quality feed received was fed to the best advantage, and great credit is due to Mr. Macauley, the curator, for getting as good results as he did in the circumstances.



Mr. J. Ryan's White Leghorn, which laid 303 eggs in the Single Test for White Leghorns—Dry Mash.

Weather Conditions.

These were more or less normal until the spring; an early and very dry summer followed, with occasionally rather high temperatures. 102 degrees was recorded on 7th November, 107 degrees on 21st December, and in February, after a temperature of 109 degrees, previous records were broken on 16th February, when 114 degrees was reached.

Deaths.

Out of 750 competing birds, 30, *i.e.*, 4 per cent., died during the year from various causes. This was not an unreasonable number, particularly in view of the fact that the parents of these birds, as well as the birds themselves, did not at all times have the pre-war quality of food so necessary to achieve the best results; in fact, it was quite a treat when either really good wheat or pollard was received at the competition, and until a higher quality of foodstuffs can be regularly maintained there can be but scant prospect of further world's records.

Mr. G. H. O'Bree's Rhode Island Red. 287 eggs.

Market Price of Eggs.

The eggs were sold to Messrs. R. G. Wilson and Coy. at 1d. per dozen over the highest quoted price in Wednesday's and Friday's morning papers, the Department of Agriculture paying cartage to the city. The revenue from the sale of eggs gave an average of 1s. 6½d. per dozen, less cartage. It must not, however, be concluded that everybody can secure this price for eggs. Great injury is done to the industry by exaggeration. The country producer would probably get a lower average price, and, in addition, generally have to pay selling commission and

rail expenses. A flock, however, that averaged as low as fourteen dozen eggs per bird, at 1s. 4d. per dozen throughout the year, after paying 12s. per bird for the feed bill, would still show a good margin of profit, exclusive of interest on capital, &c.

System of Marketing.

The eggs were packed in Lima cases holding 36 dozen eggs, each egg being packed in a wire-filler, as shown in the illustration.

Mr. W. McDougall's (Kelvin Poultry Farm) White Leghorn, which laid 297 eggs in Single Test for White Leghorns—Wet Mash.

A striking peculiarity about the market reports for agricultural produce is the fact that, while there is a more or less definite price quoted for prime quality in everything else, in the egg market the low-grade article apparently forms the basis for determining the selling price, instead of the f.a.q. grade. For example:—

"Butter.—Official quotations are as follow:—

No. 1 grade, 214s. 8d.; No. 2 grade, 196s.; and No. 3 grade, 191s. 4d. per cwt.

> Honey.—Prime, clear, extracted quoted at 6½d. per lb.; medium to good, at from 5¾d. to 6d.; and dark and candied at from 4½d. to 5d. per lb.
>
> Oats—Prime milling oats worth 5s. 9d. to 5s. 10d. yesterday, and feed oats, 5s. 5d. to 5s. 6d.
>
> Potatoes.—Prime Carman were quoted at from £6 10s., good at from £6, and medium and inferior at from about £5, according to quality.
>
> Hay.—Manger trussed was in demand from £11 10s. to £12 10s., manger sheaves at from £8 10s. to £9, and chaffing sheaves at from £6 5s. to £7 10s."

Eggs, on the other hand, were quoted on the same day as follows:—

> "Ordinary lines had quittance at from 1s. 4d. to 1s. 5d. per dozen, and private consignments at from 1s. 6d. to 1s. 8d.; selected newly-laid eggs at up to 1s. 10d.; and specially packed and delivered lots at a still higher price."

This reference to a "still higher price" appears with more or less monotonous regularity, without any one being enlightened as to the actual price or what system of packing was adopted to obtain this extra price. Perhaps it should be remarked that since the middle of March an improvement in the system of reports in one of the papers has taken place, in that new-laid eggs are now quoted before other grades.

Having established the remarkable fact that eggs alone are sold *on the basis of poor quality*, with slight increases for what are termed "private" or "special" lines, it is necessary to point out that this is one of the greatest barriers to success that the poultry industry has to contend with, seeing how great a libel such a claim should amount to. *What should decidedly be the "ordinary" egg is the egg laid by the average hen, pure and fresh, easily digested, highly nourishing, and palatable.* Instead of this, the "ordinary" egg has come to be considered on our markets as some low-grade article, which is totally unsuited for either boiling or poaching, and, in fact, barely fit to be used by bakers and pastrycooks.

To re-establish the industry, drastic reform is necessary in dealing with the "ordinary" egg, *and improvement must be made both in packing and grading.*. The low-grade egg comes in greatest numbers from districts north of the Dividing Range, where the heat is greatest, and where, in summer months, green feed is almost unobtainable, and where water is scarce and insufficiently cool. It came as a shock to the writer, and it is to be hoped that readers will be even more shocked, to learn that **during February and March 75 per cent. of eggs consigned from Northern Victoria to one of the leading egg sales rooms in Melbourne are frequently rotten.**

Reasons for Bad Eggs.

Fortunately, however, both reason and remedy are available.

(1) On the average farm in Victoria the roosters are *not* removed from the flock and penned up separately after September, and the result is that all eggs laid during the summer months in the warmer districts are seriously damaged after a few days owing to their being fertile.

(2) Very few farmers keep sufficiently large flocks of poultry to be able to consign eggs direct to the market, consequently most "farm" eggs are sold to the storekeeper

(3) Sometimes the eggs are forgotten, and sometimes—particularly towards the end of the summer, when the price is likely to rise—the farmer keeps back his eggs, and perhaps thinks little or nothing of holding them for three or four weeks at a time, with the result that they are practically unmarketable.

(4) The storekeeper doesn't really care much about the egg trade; he may carry the eggs all day in an open cart, exposed to the burning sun; and if, in consequence, the egg business doesn't pay him, what does it matter, seeing how simple it is to increase the price of other commodities and thereby recoup himself?

(5) *Packing.*—Eggs must be packed with clean, dry, and odorless material, which in remote country districts is not always readily available. (Anything damp or musty will quickly impart a taint to eggs.)

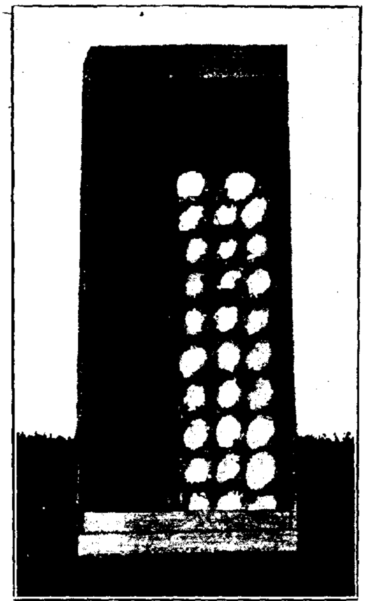
(6) *Breakages in Transit.*—It has not been possible to arrive at any definite percentage of loss for breakages. A deduction of six eggs to the case is sometimes made, which is equivalent to about 2 per cent. Many of the best class of country eggs, beautifully packed, do not pass through the sale room, but are consigned direct to grocers and others, in which cases breakages would be due to rough handling in transit. Some firms sell eggs "with all faults," consequently the buyer stands any loss, which is not then debited to the consignor, as is usually the case.

The Remedy.

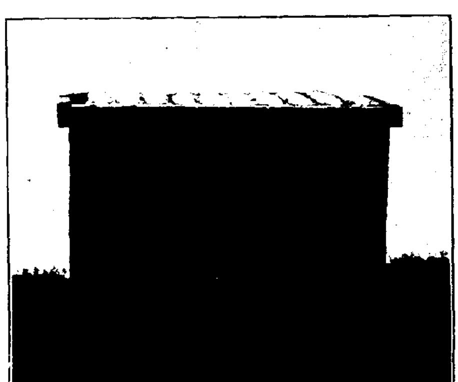
While it is within the scope of the writer to suggest various remedies, the stumbling block is how to introduce these remedies to the careless farmer or the indifferent storekeeper, neither of whom is ever much in evidence when lectures are given in country districts. The writer, a number of years ago, was present at some Highland games in Canada, when a well-known local lad was awarded second prize for sword dancing. An uproar ensued, in which the young man passionately declaimed, "The judge cheated, the judge cheated, 'a canna' be beat!" How many farmers belong to the "'canna' be taught" class? Unfortunately, a high percentage are still misguided enough to think that lecturers—holding Government appointments—must *ipso facto* be idle theorists with no practical knowledge. These farmers are a menace to the community, especially at the present time, when increased production is the only visible solution of the appalling increase in the cost of living, and when, therefore, all assistance towards improved methods in marketing should be eagerly sought after.

The illustrations on pages 331-2 show the proper methods of packing eggs for market. Straw chaff is an excellent material to use in packing, and in the packages illustrated from photographs taken by the writer 10 lbs. of chaff was the average quantity used to pack 24 dozen eggs. At this rate, one bag of straw chaff would suffice for a little more than six cases of eggs. The chaff should be returned in the empty cases, so that this is a cheap method of packing. Each of the nine rows should consist of five eggs, and with three additional eggs at one end there would be four dozen in each layer, and there are six layers in each case.

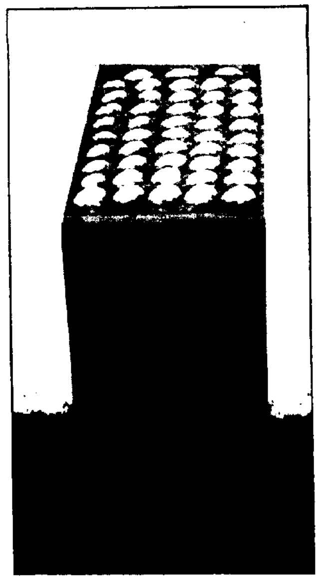
In the illustration on page 331 it will be noticed that when the case is fully packed the top layer projects slightly over the top of the case, say, from 1 to 2 inches. The case should not be shaken until the



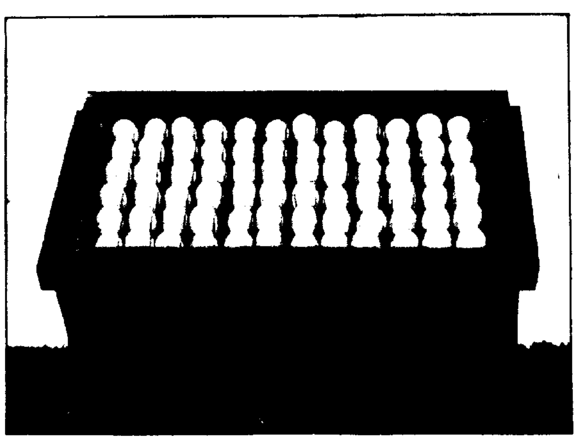
Packing Eggs—the Bottom Row.



The Finished Case.



Packing Eggs—Top Row.



Eggs Packed in Lima Case (wire fillers).

top is reached. It will be found far safer to pack on the tight side and risk cracking an odd egg on the top, rather than have the whole case loosely packed, with consequent continual breakage. Three double handfuls of chaff should be placed on the bottom of the case before the first layer of eggs is packed. The eye—unconsciously, perhaps—travels down the centre of a case, so that it is a common practice with skilled—if at times unscrupulous—packers to put the larger eggs in the centre and any smaller ones on the outside.

It must be admitted that, at present, the seller generally gets the worst of the deal. Unpacking eggs is a fruitful source of breakages, which, nevertheless, are debited to the producers, and in some markets the wholesale buyers themselves re-pack; in such cases, the temptation to crack all small-sized eggs proves somewhat alluring. The returns received by one of the most careful packers in the State show about 1 per cent. cracked and about ½ per cent. broken, results probably

Country Eggs—How Not to Do It.

mostly brought about in the unpacking. Another excellent method of marketing eggs is by means of the copper-wire fillers, which are usually padded either with paper or stout cloth, and many producers use the cardboard fillers, which are sold in sets of 25 dozen to fit in the ordinary petrol case.

A very interesting description of the Danish poultry industry was given by Mr. R. T. Mackenzie in the March issue of this *Journal*, but the Danish system of egg circles, while affording the best possible solution of the troubles of the poultry-farmer, is not practicable in all the country districts of Victoria. Denmark has an area of 55,000 square miles, and a population of 3,000,000, being about 55 persons to the square mile. Victoria, on the other hand, has an area of almost 88,000 square miles and a population of only one-half that of Denmark, which means that she has only eighteen persons to the square mile. Consequently, the expense of egg circles here makes that system at present

impracticable for us, except in the vicinity of a few of the largest towns and cities. With increased facilities for transportation, however, some system of closer co-operation than exists at present is not merely a necessity, but will prove an undoubted success.

Eggs Not Credited to Individual Birds.

At the commencement of the competition for the first 30 days (April), out of a total of 6,757 eggs no less than 1,055 were laid outside the trap-nests, being 15.61 of the aggregate, a state of affairs that was undoubtedly somewhat alarming. In May, however, the aggregate for 28 days rose to 7,295, with a decrease of 737 in eggs laid outside the traps, a percentage of 10.10. Of the 18,448 eggs laid up to the end of July, which marked the close of the four months' winter test, 1,355 were unallotted. In all, 32,500 eggs were laid during the four months' winter test; 3,147, or 9.68 per cent. of the total, were laid outside the traps. For the remaining eight months, 80,383 were laid; 570, or 0.71 per cent., being laid outside the traps. This may well be considered as approaching the irreducible minimum. Up to the end of October, the proportion of eggs laid outside the nests had, month by month, diminished enormously; after that time, the tendency of the heavy breeds, in particular, to go broody and lay in a secluded corner of the roosting-shed began to manifest itself by an increase in unallotted eggs from 0.25 per cent. in October to 1.10 per cent. in January. After the end of January, the poorer layers and persistent brooders began to stop laying, and there was again a gradual improvement in the percentage of eggs recorded in the traps.

In the recently started competition there is a very marked improvement in the trap-nest work, as, for the first 28 days, out of a total of 402 birds laying 4,387 eggs, only 105, or 2.39 per cent., as against 15.61 per cent. for the month of April, 1919, were found outside the traps. Should this improvement be maintained throughout the next couple of months, the final returns will make an excellent showing.

Weight of Eggs.

The most disappointing feature of the competition was the alarming decrease in the average weight per dozen eggs, nearly half the total number of pens failing to average 24 ounces per dozen Undoubtedly, the moderate quality of the food had some bearing on this result. At the same time it is a matter that cannot be overlooked by breeders this hatching season. For export purposes it is desirable to pack something better than the 2-oz. eggs which run 15 lbs. per long-hundred case, as 16 to 17 lbs. per 120 make better prices.

Consistent Laying.

While no exceptionally high scores were made by the groups of six birds, the Black Orpingtons, owned by Mr. S. Andrew, recorded a very fine performance for the period from 22nd May to the 19th November, the weekly tallies being 36, 34, 34, 37, 33, 34, 32, 35, 30, 37, 33, 34, 35, 37, 38, 38, 38, 40, 39, 39, 34, 36, 32, 30, 36, 37—a total of 918 eggs in 26 weeks. Mr. Tilley's White Leghorns (wet mash), 1,575, and Mr. A. Enticknap's White Leghorns (dry mash), 1,573, were excellent scores, and serve to demonstrate that there is very little to choose between the two systems of feeding, although the extra eggs laid in the winter (when eggs were dearer) by Mr. Tilley's team

enabled him to win, by a margin of 3s. 2d., the prize for highest market value of eggs, although his birds scored only two more eggs for the year.

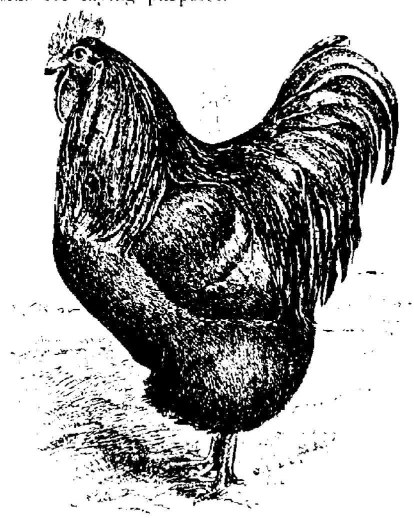
Is There a Distinct Laying Type?

So far as Black Orpingtons are concerned, there can be little doubt that there is a distinct difference between the type which in Victoria at present wins prizes as a show bird and the Black Orpington which makes big scores in the laying competitions. What do we actually understand to be the true meaning of the word "type"? According to the eminent English writer on poultry, Mr. Edward Brown, "To describe type is difficult, but it may be explained as the combination of characters which give the race its individuality and distinguish it from others. Into type the shape, conformation, size, and carriage enter more fully than coloration of plumage." It must also be remembered that where, in the past, fanciers have invariably been men interested in birds solely from the exhibition point of view, at no time have those interested in laying competitions had any vote at all regarding type. As a firm believer in the imperative necessity to adhere to type, I state confidently that it must be one that gives a reasonable prospect of prolific egg-laying—a quality the modern show Black Orpington can hardly claim. Mr. Hadlington, the New South Wales Poultry Expert, lecturing recently on "Standard Breeds of Poultry," is reported as follows:—"Dealing with the Orpington . . . . the utility breeder would have none of the show bird, and the exhibitor could have no respect for the so-called utility Orpington. Here we had two distinct classes of bird (they could scarcely be called types) passing as Orpingtons, and there was becoming utter confusion as to what was Orpington type. Yet there was the standard to consult, which had not been altered during his experience. The anomaly was that the fancier, for the most part, was breeding birds more nearly answering to the Cochin type and feathering, less the feather on the legs, than to anything else one could describe. On the other hand, we had the so-called utility type, which was in many cases much of a combination of Orpington, Langshan, and Rock, giving appearance of something approaching the type of the Rhode Island breed. Between these extremes there was imminent danger of the true Orpington type being lost, and, with it, its sterling utility qualities."

The most important part of the foregoing, from the Victorian point of view, is this:—The best of the Victorian Black Orpingtons undoubtedly are leading the world at the present moment in egg production, and now from an adjoining State comes the charge that they are not in any way true to type, being "a combination of Orpington, Langshan, and Rock." What is an Orpington? Referring again to Mr. Edward Brown, as an authority of international repute, we find in his *Races of Domestic Poultry* the following:—

> *Orpington, Black.*—This variety was originated by the late Mr. William Cook, then living at Orpington, Kent, and he gave that cognomen to the new fowls, as he was fully justified in doing. It will be better to describe the process of evolution in his own words:—"I commenced mating Minorca cocks with black Rock hens, then Langshan cocks with Minorca Rock hens. I may mention that I used birds *which exhibitors would have termed*

useless—Minorca cocks with red in their ear-lobes, the black Plymouth Rock hens thrown on one side by exhibitors as sports only from the grey, and the clean-legged Langshans of no use whatever to breed birds *such as were required by the standard of the Langshan Club* at that time. Such birds as these were put on one side for laying purposes."

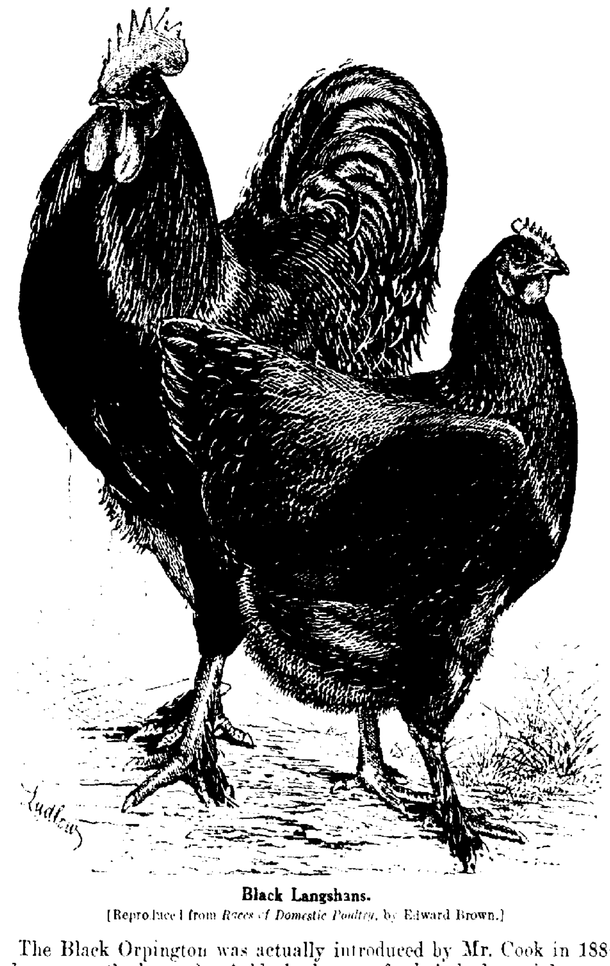


The Orpington as Originally Introduced.
[Reproduced from *Races of Domestic Poultry*, by Edward Brown.]

What the Exhibitors are Now Producing.

Mr. Cook goes on to claim that these rejected specimens are generally admitted to be the best layers. Mr. Brown continues by stating that it would be erroneous to assert that all Black Orpingtons have

descended in the manner described above; in some strains there has evidently been a considerable infusion of Cochin blood; in fact, many more nearly resemble, in brilliancy of plumage and shape, the Black Cochins exhibited about 1880, differing merely by absence of heavy hock and leg feathers.



Black Langshans.

[Reproduced from *Races of Domestic Poultry*, by Edward Brown.]

The Black Orpington was actually introduced by Mr. Cook in 1886, and was greatly boomed. A black-plumage fowl, it had special recommendations for residents in suburban and manufacturing districts, while its useful qualities and undoubted hardihood were greatly in its favour.

It will be seen, therefore, that the present-day Victorian Black Orpingtons are on the same lines as those introduced to the world by

the originator of the breed. Illustrations from Mr. Brown's *Races of Domestic Poultry* show the type of Black Orpington at the time the standard was framed, also the Black Langshan. About the latter, Mr. Brown writes:—

> Then came the introduction of the Black Orpington, which was acknowledged to be half Langshan. With the exception of being a little rounder in body and shorter in the leg, the differences are few. But, unfortunately, the *exhibitors* of Langshans began, about 1889, to change the type, with the object of getting away from the Orpington, and bred for length of leg to such an extent that the exhibition Langshan is now a leggy monstrosity, stilty, often weak-legged, but naturally heavier in bone and smaller in body than of yore. . . . The result has been disastrous in

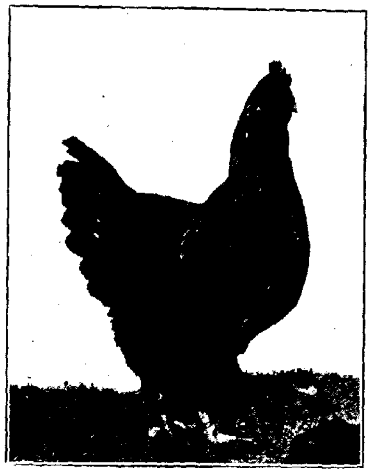
Mr. C. E. Graham's Official World's Record Black Orpington. 335 eggs, 1917-18.

> Britain. For practical purposes it is scarcely ever bred, and we could not advise any one—in spite of the quality of the egg—to adopt the modern show Langshan as an economic fowl. Fortunately, a few breeders have refused to be led away from the older type, and an attempt is being made to bring forward again what is known as the Croad Langshan.

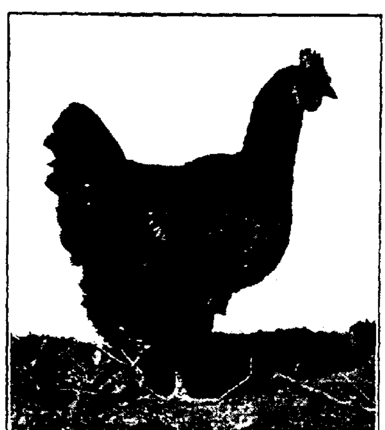
Mr. Brown's denunciation of the absurdities of the exhibition breeder are, therefore, decidedly scathing.

A study of the present-day winning type of Black Orpingtons at shows will at once make clear that, while there are undoubtedly faults on both sides—show and utility—there can be no question that the aim of the utility breeder far more nearly approaches the original conception of the breed than does that of the exhibitor. Unfortunately, a

number of people do not shoot very straight, and, in consequence, fully 50 per cent. of the birds competing in the various egg-laying tests in this State fall far short of the goal towards which all poultry-breeders



Mr. R. R. Christie's Black Orpington, which laid 274 eggs in Single Test for Black Orpingtons—Wet Mash.



Mr. Christie's Geelong Single Test Winner. 339 eggs.

should strive. According to the standard, the matured Black Orpington should weigh from 7 to 8 lbs., yet specimens under 5 lbs. are sent to those competitions, whose managers are too anxious to secure entries to bother about what birds weigh so long as their entrance-fee is paid.

It would perhaps be well to remind breeders of a rule in the Burnley competitions, which reads, "Any bird which in the opinion of the poultry expert is not considered a fair specimen of the breed, will be returned." Toleration has now been carried almost to the point of laxity, consequently this warning should be taken with the utmost seriousness.

Healthy criticism is at all times helpful, but the great interest aroused of late years by the laying competitions has caused an anxiety on the part of exhibitors that reminds me forcibly of an advertising campaign in the United States. A certain beer was widely advertised as "The beer that made Milwaukee famous." Very shortly afterwards, another city produced a beer that was equally widely advertised as "The beer that made Milwaukee jealous." A critical public can quickly form their own conclusions regarding the respective brands of Black Orpingtons.

Mr. R. R. Christie's Geelong Winner. 339 eggs.

For comparative purposes, photographs have been included of Mr. C. E. Graham's Official World's Record Black Orpington, which laid 335 eggs at the Burnley Competitions, 15th April, 1917, to 14th April, 1918, and of Mr. R. R. Christie's Black Orpington, which laid 339 eggs at the Geelong 1919-20 competitions. Though the latter competitions were not conducted officially, there is, I think, no reason to doubt the accuracy of the scores.

Management.

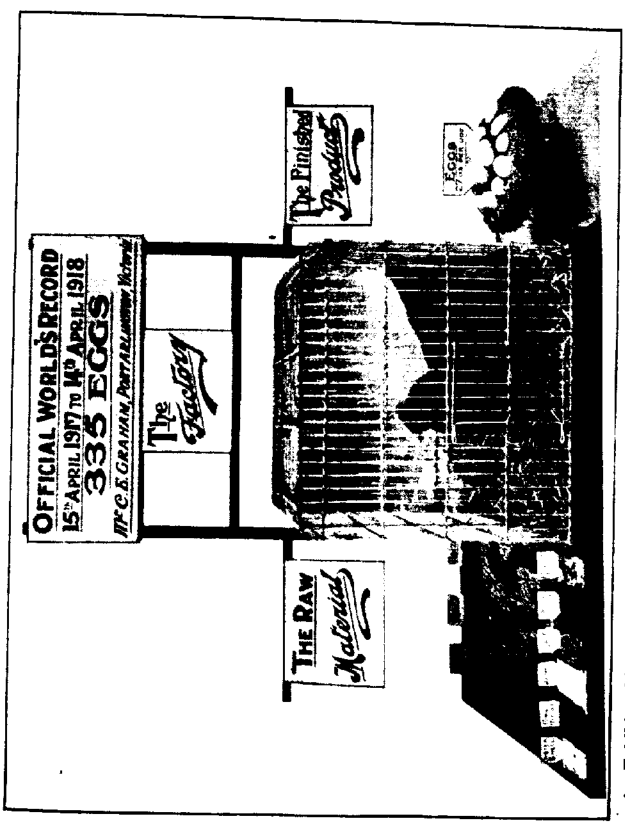
Mr. Macauley, as usual, had charge of the feeding arrangements and management of the trap-nests, and the final results were very satisfactory, particularly in view of the foodstuffs and other difficulties. The extra work, both manual and clerical, which was involved by trap-nesting 600 birds was very considerable.

The Late Mr. Alfred Hart.

During the currency of the competition the poultry world lost one of its oldest and best friends by the death, on the 18th February last, of Mr. Alfred Hart, for many years Chief Poultry Expert in the Victorian Department of Agriculture.

Regulation hours, holidays, annual leave, &c., none of these had any meaning to Mr. Hart throughout the 26 years he was a member of the Departmental staff. His only desire was to maintain the dignity and further the interests of the Department, and the development of the poultry industry and the improvement of the rabbit export trade owe more to him than is generally known.

Financially poor because of his unbounded generosity, he was rich indeed in the good wishes and affection of all those who knew him.



An Exhibit which Received Special Notice by the Prince of Wales at the Special Show held on 29th May.

TABLE I.

Monthly Results.

PERCENTAGES OF EGGS LAID OUTSIDE THE TRAPNESTS.

	Light Breeds—Wet Mash.			Light Breeds—Dry Mash.			Heavy Breeds—Wet Mash.			Heavy Breeds—Dry Mash.			Weighted Average.		
	Eggs Laid.	Un-allotted.	Per cent. Un-allotted.	Eggs Laid.	Un-allotted.	Per cent. Un-allotted.	Eggs Laid.	Un-allotted.	Per cent. Un-allotted.	Eggs Laid.	Un-allotted.	Per cent. Un-allotted.	Total Eggs Laid.	Un-allotted.	Per cent. Un-allotted.
April .. .. .. (1–30, 30 days)	3,245	301	9·27	1,417	177	12·49	1,329	387	29·11	766	190	24·93	6,757	1,055	15·61
May .. .. .. (1–28, 28 days)	3,138	154	4·90	1,616	177	10·95	1,528	246	16·09	1,013	160	15·79	7,295	737	10·10
June .. .. .. (May 19–July 2, 35 days)	3,881	247	6·36	2,014	129	6·4	2,391	312	13·04	1,425	140	9·82	9,711	828	8·52
July .. .. .. (July 3–31, 29 days)	3,561	181	5·08	2,101	67	3·18	1,986	203	10·22	1,089	76	6·42	8,737	527	6·03
August .. .. (Aug. 1–Sept. 3, 34 days)	4,425	81	1·83	3,174	35	1·10	1,689	3	0·17	1,592	66	4·16	10,880	185	1·70
September .. .. (Sept. 4–Oct. 1, 28 days)	5,004	25	0·49	2,920	4	0·13	2,045	9	0·44	1,304	1	0·07	11,273	39	0·34
October .. .. (2–29, 28 days)	4,935	10	0·20	2,903	3	0·10	1,873	9	0·48	1,212	6	0·49	10,923	28	0·25
November .. .. (Oct. 30–Nov. 26, 28 days)	4,792	12	0·25	2,741	18	0·65	1,661	23	1·38	1,020	15	1·47	10,214	68	0·66
December .. .. (Nov. 27–Dec. 31, 35 days)	5,435	24	0·44	3,290	14	0·42	1,881	17	0·90	1,088	18	1·65	11,694	73	0·62
January .. .. (1–29, 29 days)	4,033	27	0·66	2,311	15	0·64	1,433	29	2·02	796	24	3·01	8,573	95	1·10
February .. .. (Jan. 30–Feb. 25, 27 days)	4,019	30	0·74	2,175	10	0·45	1,352	12	0·88	780	6	0·77	8,326	58	0·69
March .. .. .. (Feb. 26–March 31, 35 days)	4,010	11	0·27	2,214	4	0·18	1,401	4	0·28	875	5	0·57	8,500	24	0·28
Total	50,478	1,103	2·18	28,876	653	2·26	20,569	1,254	6·09	12,960	707	5·45	112,883	3,717	3·29

FINAL SCORES.

Department of Agriculture, Victoria.

NINTH EGG-LAYING COMPETITION, CONDUCTED AT THE SCHOOL OF PRIMARY AGRICULTURE AND HORTICULTURE, BURNLEY, COMMENCED 1ST APRIL, 1919, CONCLUDED 31ST MARCH, 1920.

RECORD OF EGGS LAID TO THE 31st MARCH, 1920.

Section A.—Groups of Six Birds Trapnested.

Pen No.	Competitor.	Hen. 1.	2.	3.	4.	5.	6.	(x).	Total to 31st March, 1920.
	Class 1.—Light Breeds (White Leghorns), except Pen 19 (Black Minorcas), Wet Mash.								
23	P. N. Tilley ..	312	272	262	264	190	264	11	1,575
38	C. Ridley ..	186	216	259	261	267	223	9	1,421
15	J. Wharton ..	245	222	229	223	258	225	16	1,418
6	Geo. White ..	255	263	239	190	214	192	31	1,384
1	Montuna P.F. ..	270	252	(*d*) 204	193	238	204	16	1,377
20	G. McDonnell ..	238	242	252	204	243	183	10	1,372
24	Alf. Canning ..	251	247	223	247	216	167	9	1,360
27	W. M. Bayles ..	212	230	181	210	261	237	18	1,349
5	Miss M. T. Kidd ..	196	296	196	221	204	191	34	1,338
2	Murphy Bros. ..	219	209	232	197	225	220	21	1,323
26	W. K. Mitchell ..	213	185	227	216	262	198	6	1,307
9	H. T. Mason ..	192	260	240	214	246	100	51	1,303
46	A. J. Watts ..	235	202	210	211	233	198	7	1,296
10	H. Miller ..	168	244	253	196	229	189	15	1,294
36	A. A. Harvey ..	174	235	232	223	250	153	27	1,294
39	N. Meyers ..	271	222	169	228	183	208	9	1,290
13	G. Pocknall ..	246	218	263	257	133	(*d*) 132	36	1,285
35	Deep Spring P.F.	236	180	228	218	227	179	16	1,284
22	Mrs. C. G. Viney ..	192	(*d*) 211	188	246	161	255	15	1,268
7	J. B. Nicoll ..	230	21	162	260	190	188	14	1,265
45	Thos. Young ..	192	233	213	171	204	214	18	1,245
37	John A. Carter ..	217	71	212	261	237	195	28	1,221
8	H. W. Bond ..	166	188	185	211	200	235	16	1,201
25	H. Schmutter ..	186	244	166	198	212	181	7	1,194
29	W. Godden ..	253	192	171	175	161	217	18	1,187
18	J. Ogilvie ..	194	210	181	190	199	202	0	1,186
40	D. Gibson ..	209	167	219	167	223	191	9	1,185
21	E. A. Underwood	222	192	182	136	216	9	16	1,183
12	D. Hall ..	218	189	167	178	217	185	16	1,170
28	E. McDonnell ..	212	167	215	203	196	149	24	1,166
34	Mrs. J. Hall ..	218	180	166	187	223	176	7	1,157
41	Mrs. H. Stevenson	(*d*) 124	229	168	191	240	183	18	1,153
11	John Butler ..	183	200	167	206	143	196	50	1,145
16	C. R. Barrett ..	(*d*) 95	267	217	224	98	211	6	1,118
30	R. E. Exelby ..	154	151	155	86	146	143	272	1,107
33	J. Black ..	237	239	45	40	151	182	179	1,073
17	Herbert Bros. ..	(*d*) 50	241	(*d*) 94	197	237	222	7	1,048
14	Gedye Bros. ..	222	223	183	186	194	(*d*) 16	9	1,033
19	Champion P.F. ..	215	180	137	147	155	196	2	1,032
43	F. Gaskell ..	171	162	152	198	61	215	11	970
42	H. Hanbury ..	281	230	261	12	13	(*d*) 95	9	901

NOTE.—Death of birds marked thus (*d*).
Eggs laid outside nest denoted thus (x).

FINAL SCORES—*continued.*

SECTION A.—GROUPS OF SIX BIRDS TRAPNESTED—*continued.*

Pen No.	Competitor.	Hen. 1.	2.	3.	4.	5.	6.	(x).	Total to 31st March, 1920.
	Class 2.—Light Breeds (White Leghorns), Dry Mash.								
62	A. Enticknap ..	273	254	264	259	279	242	2	1,573
48	Geo. White ..	199	260	271	198	275	241	12	1,456
67	W. H. Robbins ..	248	236	145	224	208	229	98	1,388
64	C. Ridley ..	261	222	220	231	223	130	89	1,376
54	A. Chung ..	225	234	218	207	226	239	15	1,364
60	Kelly and Amess..	226	200	183	195	266	167	113	1,350
51	J. W. Leyden ..	221	281	230	222	133	193	21	1,301
47	E. A. Underwood	226	183	236	243	(*d*) 151	248	4	1,291
55	J. Wharton ..	264	273	222	114	196	208	12	1,289
65	Gedye Bros. ..	212	242	206	240	183	173	15	1,271
61	Fulham Park ..	160	184	257	198	221	232	16	1,268
68	W. M. Bayles ..	244	(*d*) 199	197	244	160	181	9	1,234
70	H. Bunge ..	213	135	204	234	183	252	13	1,234
53	W. H. Dunn ..	208	175	(*d*) 133	231	213	180	65	1,205
49	J. Ogilvie ..	167	178	240	226	159	224	10	1,204
57	N. Meyers ..	(*d*) 147	190	244	221	177	209	4	1,192
58	J. O'L. Tabuteau..	198	128	181	235	215	187	48	1,192
56	P. N. Tilley ..	(*d*) 29	215	247	238	233	205	17	1,184
50	E. McDonnell ..	207	216	12	259	226	249	6	1,175
59	Maitland P.F. ..	238	228	134	(*d*) 9	242	208	13	1,156
69	G. McDonnell ..	227	195	272	219	(*d*) 1	170	36	1,120
52	John A. Carter ..	168	245	106	105	187	205	20	1,036
63	E. Fox	186	225	23	120	251	197	15	1,017
	Class 3.—Heavy Breeds (Black Orpingtons), Wet Mash.								
81	S. Andrew ..	253	268	249	169	218	270	126	1,553
85	C. E. Graham ..	248	290	206	218	248	135	75	1,420
82	F. G. Clamp ..	227	226	179	211	214	256	27	1,340
79	Marville P.F. ..	230	193	181	193	229	251	19	1,296
72	A. D. McLean ..	198	135	182	247	221	160	142	1,285
88	Mrs. E. Griffiths ..	171	163	243	190	230	180	90	1,267
71	J. C. Mickelburough	176	206	221	136	137	267	112	1,255
87	F. R. N. Evans ..	180	184	258	209	154	204	36	1,225
77	D. Fisher ..	162	182	174	193	262	209	40	1,222
76	E. Pearson ..	244	200	182	183	174	168	40	1,191
86	Gedye Bros. ..	211	107	139	166	192	192	147	1,154
74	A. Bennett ..	207	160	225	192	113	209	28	1,134
83	F. C. S. Fredricksen	151	191	185	131	144	229	102	1,133
84	W. Hagley ..	203	110	157	190	232	114	72	1,078
78	R. R. Christie ..	236	138	20	201	(*d*) 191	204	48	1,038
75	Hall's Egg Farm ..	(*d*) 96	177	133	232	210	160	23	1,031
80	Ampero P.F. ..	(*d*) 41	198	113	178	130	160	127	947
	Class 4.—Heavy Breeds (Black Orpingtons, except Pens 92 and 97, R.I.R.), Dry Mash.								
94	J. W. Leyden ..	227	240	235	230	242	270	14	1,458
100	Gedye Bros. ..	138	171	202	216	181	258	159	1,325
93	C. F. Watts ..	213	259	165	229	214	202	43	1,325
95	R. R. Christie ..	243	273	169	157	183	220	18	1,263
96	J. C. Mickelburough	167	205	191	222	126	237	51	1,199
99	T. L. Eastaugh ..	229	164	217	(*d*) 179	230	105	31	1,155
91	A. D. McLean ..	199	230	195	72	187	202	64	1,149
97	D. Fisher ..	156	247	181	125	183	137	83	1,112
92	A. Bennett ..	151	168	198	169	195	142	35	1,058
98	Marville P.F. ..	136	139	205	(*d*) 98	215	184	17	994
90	Kelly and Amess	39	192	(*d*) 123	97	145	134	192	922

NOTE.—Death of birds marked thus (*d*).
Eggs laid outside nest denoted thus (x).

FINAL SCORES—*continued.*

Section B.—Individual Birds.

Class 1.—Leghorns, Wet Mash.

Pen No.	Competitor.	Breed.	Total to 31st March, 1920.	Pen No.	Competitor.	Breed.	Total to 31st March, 1920.
49	Kelvin, P.F. ..	White Leghorns	297	15	Alf. Canning ..	White Leghorns	230
14	Alf. Canning ..	,,	286	55	H. McKenzie and Son	,,	228
20	E. S. Jeffrey ..	,,	286	54	E. A. Underwood	,,	227
13	B. Brown ..	,,	279	10	Mrs. J. Roberts	..	227
4	G. H. Answorth	,,	278	50	Kelvin P.F. ..	..	226
39	Gedye Bros. ..	,,	277	42	Fulham Park ..	..	224
1	G. McDonnell ..	,,	270	30	H. J. Bloomfield	..	223
9	Mrs. J. Roberts	,,	262	52	G. Ochiltree ..	..	219
40	Gedye Bros. ..	,,	259	11	John Christie ..	..	218
43	F. W. McPherson	,,	257	17	R. E. Palmer ..	,,	216
22	A. J. Watts ..	,,	255	29	H. J. Bloomfield	..	210
33	McCormack and Kinzell	,,	254	48	W. M. Bayles ..	,,	210
53	E. A. Underwood	,,	254	34	McCormack and Kinzell	,,	207
2	G. McDonnell ..	,,	253	7	F. D. Anderson	,,	204
47	W. M. Bayles ..	,,	252	3	G. H. Answorth	,,	202
23	Herbert Bros. ..	,,	250	18	R. E Palmer ..	,,	201
44	F. W. McPherson	,,	250	51	G. Ochiltree ..	,,	199
6	Miss A. McPherson	,,	247	27	A. C. Nichols ..	,,	196
56	H. McKenzie and Son	,,	243	5	Miss A. McPherson	,,	190
14	B. Brown ..	..	242	57	Miss G. Morgan	..	188
37	Chas. I. Corbould	,,	242	36	Wallace Clark ..	.	185
21	A. J. Watts ..	,,	241	45	Bambra P.F. ..	..	185
26	L. Faulkner ..	,,	239	38	C. I. Corbould ..	,,	181
28	A. C. Nichols ..	..	239	41	Fulham Park ..	..	181
8	F. B. Anderson	..	236	12	John Christie ..	..	179
24	Herbert Bros. ..	..	236	31	C. Fretwell ..	..	177
19	E. S. Jeffrey ..	..	234	32	C. Fretwell ..	..	170
25	L. Faulkner ..	,,	234	46	Bambra P.F. ..	..	159
58	Miss G. Morgan	..	234	35	Wallace Clark ..	..	151

Class 2.—Leghorns, Dry Mash.

Pen No.	Competitor.	Breed.	Total to 31st March, 1920.	Pen No.	Competitor.	Breed.	Total to 31st March, 1920.
59	Jack Ryan ..	White Leghorns	303	75	W. D. Alexander	White Leghorns	220
66	J. N. Baker ..	..	282	69	Gedye Bros. ..	..	217
83	G. McDonnell ..	,,	276	64	T. A. Pettigrove	,,	213
84	G. McDonnell ..	..	270	73	L. McLean ..	..	212
76	W. D. Alexander	..	260	65	J. N. Baker ..	..	192
74	L. McLean ..	,,	257	70	Gedye Bros. ..	..	188
79	W. H. Thomas..	..	252	60	Jack Ryan ..	.. (*d*)	186
67	W. M. Bayles ..	..	250	78	John A. Carter	..	167
72	G. F. Walbran	,,	249	62	E. A. Lawson ..	..	158
80	W. H. Thomas..	,,	240	71	G. F. Walbran	.. (*d*)	123
77	John A. Carter	..	237	81	Mrs. J. Roberts	..	60
68	W. M. Bayles ..	,,	230	61	E. A. Lawson ..	,, (*d*)	38
82	Mrs. J. Roberts	..	226	63	T. A. Pettigrove	..	29

NOTE.—Death of birds marked thus (*d*).

FINAL SCORES—*continued.*

SECTION B.—INDIVIDUAL BIRDS—*continued.*

Class 3.—Light Breeds other than Leghorns, Wet Mash.

Pen No.	Competitor.	Breed.	Total to 31st March, 1920.	Pen No.	Competitor.	Breed.	Total to 31st March, 1920.
89	Mentuna P.F. ..	Ancona	215	86	Mrs. G. R. Bald	Ancona	171
85	Mrs. G. R. Bald	,,	203	87	Ronald Hardy	,,	166
90	Mentuna P.F. ..	,,	203	88	Ronald Hardy	,,	80

Class 4.—Orpingtons Any Colour, Wet Mash.

Pen No.	Competitor.	Breed.	Total to 31st March, 1920.	Pen No.	Competitor.	Breed.	Total to 31st March, 1920.
101	R. R. Christie ..	Black Orpingtons	274	98	Mrs. E. A. Long	Black Orpingtons	211
110	Martini P.F. ..	,,	254	118	H. I. Merrick ..	,,	210
127	Red Mill P.F. ..	,,	254	129	East Kew P.F.	,,	208
114	Wanchai P.F. ..	,,	247	108	J. W. Leyden ..	,,	204
105	Morgan and Watson	,,	246	128	Red Mill P.F. ..	,,	203
				126	A. Bennett ..	,,	201
111	E. A. Lawson ..	,,	243	116	A. F. Fox ..	,,	200
112	E. A. Lawson ..	,,	243	104	T. H. Wakefield	,,	198
121	W. G. Gist ..	,,	242	124	Chanticleer P.F.	,,	196
120	Bambra P.F. ..	,,	240	100	W. Hagley ..	,,	195
96	Gedye Bros. ..	,,	238	103	T. H. Wakefield	,,	195
107	J. W. Leyden ..	,,	238	93	J. H. Nichols ..	,, (*d*)	188
97	Mrs. E. A. Long	,,	235	122	W. G. Gist ..	,,	179
109	Martini P.F. ..	,,	232	92	Percy Walker ..	,,	174
106	Morgan and Watson	,,	228	117	H. I. Merrick ..	,,	169
				119	Bambra P.F. ..	,,	152
91	Percy Walker ..	,,	223	102	R. R. Christie ..	,,	147
123	Chanticleer P.F.	,,	221	125	A. Bennett ..	,,	145
113	Wanchai P.F. ..	,,	216	99	W. Hagley ..	,,	115
115	A. F. Fox ..	,,	216	94	J. H. Nichols ..	,,	106
95	Gedye Bros. ..	,,	214	130	East Kew P.F.	,, (*d*)	28

Class 5.—Heavy Breeds other than Orpingtons, Wet Mash.

Pen No.	Competitor.	Breed.	Total to 31st March, 1920.	Pen No.	Competitor.	Breed.	Total to 31st March, 1920.
136	G. H. O'Bree ..	R.I.R.	287	143	F. R. De Garis ..	L.	195
149	A. Bennett ..	,,	259	138	Miss H. Koch ..	R.I.R.	194
142	M. Whitley ..	,,	251	132	J. W. Richards	,,	190
137	Miss H. Koch ..	,,	245	134	F. H. Thiel ..	,,	187
150	A. Bennett ..	,,	235	148	Jas. Ryan ..	,,	178
147	Jas. Ryan ..	,,	226	145	A. Angus ..	,,	174
141	M. Whitley ..	,,	225	133	F. H. Thiel ..	,,	165
139	Mrs. G. R. Bald	W.P.R.	219	144	F. R. De Garis ..	L.	165
131	J. W. Richards	R.I.R.	217	146	A. Angus ..	R.I.R.	154
135	G. H. O'Bree ..	,,	210	140	Mrs. G. R. Bald	W.P.R.	137

NOTE.—Death of birds marked thus (*d*).

WEIGHT OF EGGS.

Pen No.	Name.	Number of Eggs.	Weight of Eggs.	Average Weight of Egg.	Average Weight per Dozen.
			oz.	oz.	oz.
	Class 1.—Light Breeds, Wet Mash.				
1	Montuna, P. F.	1,377	2,716	1·972	23·664
2	Murphy Bros.	1,323	2,596	1·962	23·544
3	(Vacant).				
4	(Disqualified).				
5	Kidd, Miss M. T.	1,338	2,656¾	1·985	23·820
6	White, Geo.	1,384	2,777½	2·006	24·072
7	Nicoll, J. B.	1,265	2,547½	2·013	24·156
8	Bond, H. W.	1,201	2,374	1·976	23·712
9	Mason, H. T.	1,303	2,793½	2·143	25·716
10	Miller, H.	1,294	2,566½	1·983	23·796
11	Butler, John	1,145	2,311	2·018	24·216
12	Hall, D.	1,170	2,401	2·052	24·624
13	Pocknall, G.	1,285	2,440	1·898	22·776
14	Gedye Bros.	1,033	2,066½	2	24
15	Wharton, J.	1,418	2,629½	1·854	22·248
16	Barrett, C. R.	1,118	2,227	1·991	23·892
17	Herbert Bros.	1,048	2,189	2·088	25·056
18	Ogilvie, J.	1,186	2,157	1·818	21·816
19	Champion, P. F.	1,032	2,307¼	2·235	26·820
20	McDonnell, G.	1,372	2,810	2·048	24·576
21	Underwood, E. A.	1,183	2,345½	1·982	23·784
22	Viney, Mrs. C. G.	1,268	2,611	2·059	24·708
23	Tilley, P. N.	1,575	3,158	2·005	24·06
24	Canning, Alf.	1,360	2,726	2·004	24·048
25	Schmutter, H.	1,194	2,623½	2·197	26·364
26	Mitchell, W. K.	1,307	2,575½	1·97	23·64
27	Bayles, W. M.	1,349	2,729	2·023	24·276
28	McDonnell, E.	1,166	2,379	2·04	24·48
29	Godden, W.	1,187	2,281	1·921	23·052
30	Exelby, R. E.	1,107	2,281	2·06	24·72
31	(Disqualified).				
32	(Disqualified).				
33	Black, J.	1,073	2,168½	2·02	24·24
34	Hall, Mrs. J.	1,157	2,310¾	1·996	23·952
35	Deep Spring Poultry Farm	1,284	2,544½	1·981	23·762
36	Harvey, A. A.	1,294	2,585½	1·998	23·976
37	Carter, J. A.	1,221	2,416½	1·979	23·748
38	Ridley, C.	1,421	2,801½	1·971	23·652
39	Meyers, N.	1,290	2,501½	1·936	23·232
40	Gibson, D.	1,185	2,475½	2·089	25·068
41	Stevenson, Mrs. H.	1,153	2,303	1·997	23·964
42	Hanbury, H.	901	1,783	1·978	23·736
43	Gaskell, F.	970	2,056½	2·12	25·44
44	(Disqualified).				
45	Young, Thos.	1,245	2,633	2·114	25·368
46	Watts, A. J.	1,296	2,607½	2·011	24·132
	Class 2.—Light Breeds, Dry Mash.				
47	Underwood, E. A.	1,291	2,544	1·970	23·64
48	White, Geo.	1,456	3,015	2·07	24·84
49	Ogilvie, J.	1,204	2,412½	2·003	24·036
50	McDonnell, E.	1,175	2,393½	2·037	24·444
51	Leyden, J. W.	1,301	2,753	2·116	25·392
52	Carter, J. A.	1,036	1,993½	1·924	23·088

WEIGHT OF EGGS—*continued*.

Pen No.	Name.	Number of Eggs.	Weight of Eggs.	Average Weight of Egg.	Average Weight per Dozen.
			oz.	oz.	oz.
	CLASS 2.—LIGHT BREEDS, DRY MASH—*continued*.				
53	Dunn, W. H.	1,205	2,123	1·761	21·132
54	Chung, A.	1,364	2,706	1·983	23·796
55	Wharton, J.	1,289	2,602½	2·019	24·228
56	Tilley, P. N.	1,184	2,439	2·06	24·72
57	Meyers, N.	1,192	2,401	2·014	24·168
58	Tabuteau, J. O.	1,192	2,349½	1·971	23·652
59	Maitland, P. F.	1,156	2,334½	2·094	25·128
60	Kelly and Amess	1,350	2,694	1·988	23·856
61	Fulham Park	1,268	2,525½	1·991	23·892
62	Enticknap, A.	1,573	3,129½	1·989	23·868
63	Fox, E.	1,017	2,041½	2·007	24·084
64	Ridley, C.	1,376	2,769	2·012	24·144
65	Gedye Bros.	1,271	2,522½	1·984	23·808
66	(Vacant).				
67	Robbins, W. H.	1,388	2,590	1·866	22·392
68	Bayles, W. M.	1,234	2,464½	1·592	19·004
69	McDonnell, G.	1,120	2,227	1·988	23·856
70	Bunge, H.	1,234	2,477½	2·007	24·084
	Class 3.—Heavy Breeds, Wet Mash.				
71	Mickelburough, J. C.	1,255	2,585	2·059	24·708
72	McLean, A. D.	1,285	2,663½	2·072	24·864
73	(Disqualified).				
74	Bennett, A.	1,134	2,299½	2·027	24·324
75	Hall's Egg Farm	1,031	2,182	2·116	25·392
76	Pearson, E.	1,191	2,320	1·947	23·364
77	Fisher, D.	1,222	2,321½	1·899	22·788
78	Christie, R. R.	1,038	2,105	2·027	24·324
79	Marville, P. F.	1,296	2,593	2·0007	34·008
80	Ampere, P. F.	947	1,898	2·004	24·048
81	Andrew, S.	1,553	3,100½	1·99	22·88
82	Clamp, F. G.	1,340	2,809	2·096	25·152
83	Fredricksen, F. C. S.	1,133	2,241¾	1·978	23·736
84	Hagley, W.	1,078	2,179½	2·021	24·252
85	Graham, C. E.	1,420	2,876	2·025	24·3
86	Geyde Bros.	1,154	2,490	2·157	25·884
87	Evans, F. R. N.	1,225	2,475½	2·02	24·24
88	Griffiths, Mrs. E.	1,267	2,529	1·996	23·952
89	(Disqualified).				
	Class 4.—Heavy Breeds, Dry Mash.				
90	Kelly and Amess	922	1,854	2·011	24·132
91	McLean, A. D.	1,149	2,096¼	1·824	21·888
92	Bennett, A.	1,058	2,295½	2·169	26·028
93	Watts, C. F.	1,325	2,664	2·01	24·12
94	Leyden, J. W.	1,458	2,982½	2·045	24·54
95	Christie, R. R.	1,263	2,513	1·989	23·868
96	Mickelburough, J. C.	1,199	2,363	1·97	23·64
97	Fisher, D.	1,112	2,487½	2·236	26·832
98	Marville, P. F.	994	1,949	1·95	23·40
99	Eastaugh, T. L.	1,155	2,164	1·873	22·476
100	Gedye Bros.	1,325	2,518	1·9	22·8

PRIZE LIST.

For the greatest total number of eggs laid by a pen in each Class of Sections "A" and "B":—

Section A.—Groups of Six Birds.

Class 1.—Light Breeds.—Wet Mash—

1st Prize, Champion Certificate: P. N. Tilley, 3 Campbell-road, Balwyn.
2nd Prize, Government Certificate: C. Ridley, Auburn-avenue, Northcote.
3rd Prize, Government Certificate: J. Wharton, Swansea-road, Chelsea.

Class 2.—Light Breeds.—Dry Mash—

1st Prize, Champion Certificate: A. Enticknap, 216 High-street, Prahran.
2nd Prize, Government Certificate: G. White, Wattle Park P.F., Traralgon.
3rd Prize, Government Certificate: W. H. Robbins, 180 Riversdale-road, Glenferrie.

Class 3.—Heavy Breeds.—Wet Mash—

1st Prize, Champion Certificate: S. Andrew, 10 Lysterville-avenue, Malvern.
2nd Prize, Government Certificate: C. E. Graham, "All Black" P.F., Portarlington.
3rd Prize, Government Certificate: F. G. Clump, "Mont View," Macedon.

Class 4.—Heavy Breeds.—Dry Mash—

1st Prize, Champion Certificate: J. W. Leydon, Sunbury.
2nd Prize, Government Certificate: *Gedye Bros., Railway-road, Blackburn.
*C. F. Watts, 285 Malvern-road, East Malvern.

Section B.—Individual Birds.

Class 1.—Leghorns.—Wet Mash—

1st Prize, Champion Certificate: Kelvin P.F. (W. McDougall), Castlemaine.
2nd Prize, Government Certificate: *Alf. Canning, 1 McLean-street, W. Brunswick.
*E. S. Jeffrey, 334 Clark-street, Northcote.

Class 2.—Leghorns.—Dry Mash—

1st Prize, Champion Certificate: Jack Ryan, Silvan, *via* Evelyn.
2nd Prize, Government Certificate: J. N. Biser, Somerville.
3rd Prize, Government Certificate: G. McDonnell, 150 Camberwell-road, Auburn.

Class 3.—All Light Breeds other than Leghorns.—Wet Mash—

1st Prize, Champion Certificate: Montuna P.F. (A. K. and H. S. Luke), Beaconsfield.
2nd Prize, Government Certificate: *Mrs. G. R. Bald, Sefton-place, East Camberwell.
*Montuna P.F. (A. K. and H. S. Luke), Beaconsfield.

Class 4.—Orpingtons, any colour.—Wet Mash—

1st Prize, Champion Certificate: R. R. Christie, St. Elms P.F., Bentleigh.
2nd Prize, Government Certificate: *Martini P.F. (T. Kirk), 18 Toward-street, Murrumbeena.
*Red Mill P.F. (A. W. Smith), Cheltenham.

Class 5.—All Heavy Breeds other than Orpingtons.—Wet Mash—

1st Prize, Champion Certificate: G. H. O'Bree, cr. Duke and Walpole streets, Kew.
2nd Prize, Government Certificate: A. Bennett, "Tare," Willow-grove, East Camberwell.
3rd Prize, Government Certificate: M. Whitley, Lingwell-road, Auburn.

* Equal.

For the greatest total number of eggs laid by individual birds in each Class of Section "A."

Class 1.—Light Breeds—Wet Mash.

1st Prize, Champion Certificate: P. N. Tilley, 3 Campbell-street, Balwyn.
2nd Prize, Government Certificate: Miss M. T. Kidd, The Wattles, Barker's Creek.
3rd Prize, Government Certificate: H. Hanbury, "Eileen," High-street, Prahran.

Class 2.—Light Breeds.—Dry Mash.

1st Prize, Champion Certificate: J. W. Leydon, Sunbury.
2nd Prize, Government Certificate: A. Enticknap, 216 High-street, Prahran.
3rd Prize, Government Certificate: G. White, Wattle Park P. F., Traralgon.

Class 3.—Heavy Breeds.—Wet Mash.

1st Prize, Champion Certificate: C. E. Graham, "All Black" P. F., Portarlington.
2nd Prize, Government Certificate: S. Andrew, 10 Lysterville-avenue, Malvern.
3rd Prize, Government Certificate: S. Andrew, 10 Lysterville-avenue, Malvern.

Class 4.—Heavy Breeds.—Dry Mash.

1st Prize, Champion Certificate: R. R. Christie, St. Elms P. F., Bentleigh.
2nd Prize, Government Certificate: C. F. Watts, 295 Malvern-road, E. Malvern.
3rd Prize, Government Certificate: Gedye Bros., Railway-road, Blackburn.

For the pen which shows the greatest average weight per dozen eggs laid:—

Section A.—Groups of Six Birds.

1st Prize, Government Certificate: H. Schmutter, 26·924 ozs. per dozen.

For the pen the eggs of which realized the highest market value throughout the competition:—

Section A.—Groups of Six Birds.

1st Prize, Government Certificate: P. N. Tilley (pen 23), 1,575 eggs; value, £9 15s. 10d.

SMALL FRUIT CULTURE IN VICTORIA.

A. A. Hammond, Orchard Supervisor.

The small fruits dealt with in this article are known in England and the United States of America as bush fruits. These include the brambles (raspberry, blackberry, and hybrids) and the groselles (gooseberry and currants). The cultural methods and the climatic and soil requirements of other small fruits cultivated in Victoria have nothing in common with the bush fruits; therefore it was thought out of place to include them in this article.

Bush fruits can be grown, with proper care and attention, in a wide range of soil and climate; but, if grown commercially on a large scale, particular attention must be given to climatic and soil conditions. Although the requirements of these fruits are very similar, there is a considerable variation in the different species, and even in varieties of the same species, in respect to hardiness, susceptibility to injury by frosts, and in other ways. These variations will be considered when dealing with the different fruits in detail.

Most bush fruits thrive best in the cool mountainous and hilly districts of the State. Here the rainfall is usually good, and, providing the soil is of the right character, the plants grow luxuriantly and are fruitful. Although the brambles are not fastidious in their soil requirements, they prefer a rich, deep, and rather heavy moist loam. They will not thrive on waterlogged land, but a sufficiency of moisture is essential, otherwise plants will be stunted and unfruitful.

During the past few years there has been a considerable increase in the production of blackberries and the so-called hybrid loganberry, particularly the latter, but there has been no appreciable increase in the yield of other small fruits.

In the season 1909-10, according to the *Victorian Year-Book*, 325 bushels of blackberries were produced in commercial orchards, and a gradual increase in the production of this berry has been recorded till the season 1917-18, when the yield for the State reached 1,078 bushels. No record has been kept of the quantity of loganberries grown, but there has been an undoubted increase. Although the plantations are small—the largest known to the writer being 3½ acres—the popularity and adaptability of this berry to several commercial uses is certain to lead to an expansion in the loganberry area during the next few years.

The Loganberry.

The loganberry was formerly thought to be a hybrid, *i.e.*, a cross between two species of the genus *Rubus*, but recent investigations appear to have proved that it is a variety of the dewberry—a trailing form of the blackberry.

In 1881, Judge Logan, of Santa Cruz, California, raised the loganberry from seeds of a dewberry called the auginbaugh. As this plant was growing in juxtaposition to that of an Antwerp red raspberry, and as the fruit of the seedling appeared to have the characteristics of both these plants, he concluded that it was a hybrid.

Now, however, there seems to be little doubt, as recorded in *Bulletin* 998, U.S.A., Department of Agriculture, that the loganberry is a variety of the dewberry, which grows wild on the Pacific Coast.

EXTENT OF ITS CULTURE.

The loganberry has been cultivated in the southern districts of Victoria, particularly those within carting distance of the metropolitan markets.

The climatic conditions south of the Dividing Range are, speaking generally, suited to its cultivation; but, as the loganberry is susceptible to injury from frost, is liable to sun scald, and is injuriously affected by strong winds, there are localities where it could not be successfully

A Good Crop of Loganberries.

grown. The climatic condition of the mountainous and hilly districts of the eastern and north-eastern portions of the State should also be adapted to its cultivation. With an adequate supply of water it could doubtless also be profitably grown in the dry, warm northern districts of the State.

SITE.

In choosing the locality for a plantation, contiguity of markets is of considerable importance. Growers within carting distance of the

metropolis or other populous centres are placed at a great advantage, for not only can they market the fruit more cheaply, but they can place it on the market in the best possible condition.

The ideal site for a plantation is one where the soil is a deep, moist, well-drained, rather heavy loam, and is naturally sheltered from strong winds. Many successful plantations are situated in rather low-lying land, which is naturally sheltered, but care must be taken to avoid gullies, where the air drainage is bad, and which, consequently, are subject to heavy frosts.

The loganberry is a comparatively early bloomer, coming into bloom from 20 to 30 days before kindred berries; therefore, the crop may sometimes be destroyed by a late frost, when the lawtonberry, for instance, escapes injury.

DRAINAGE.

Even in fairly well-drained land it pays to underdrain, but where the natural drainage is bad underdrainage is essential. Two-inch tile drains, from 20 to 30 feet apart, and from 2 ft. 6 in. to 3 feet deep, are recommended. In shallow soils with a heavy retentive clay subsoil the drains should not be more than 20 feet apart, nor more than 2 ft. 6 in. deep. In deep fairly porous soils the drains may be placed farther apart, and should be 3 feet deep. In some cases drainage of the wettest portions may be sufficient. When timber is available and cheap, a well-made wooden drain is effective, and will last as long as the plantation. In making a drain it is important that the clay taken out last should be returned first and firmly trodden down. Water should enter the drains from the bottom, not from the top as is often thought. The practice of placing brush or other rubbish immediately on top of the drain and filling in loosely, so that the water may enter from the top, is altogether wrong, and drains so constructed will soon silt up and become choked. The importance of good drainage cannot well be over-estimated.

Briefly, it may be said that effective underdrainage increases the root pasturage by inducing plants to root more deeply. Well-drained land is warmer and drier in the winter, and cooler and moister in the summer, than undrained land. Underdrainage aerates and enriches the soil by increasing bacterial activity, upon which depends the liberation of essential plant foods.

PROTECTION FROM WINDS.

If there is no natural shelter, a breakwind of *Pinus insignus* or other suitable trees should be provided. Loganberries are injured by strong winds, and, although care in tying up minimizes the damage, they thrive better when sheltered.

Hot winds also do much damage by scalding the ripe berries. Fortunately, however, only a small percentage of the crop is ripe at any one time, and, as the ripe berries only are injured, the loss is not great unless these winds recur frequently during the ripening season. Where there are strong prevailing winds, it is advisable to plant the rows parallel to the direction of the wind.

PREPARATION OF THE LAND.

If it is intended to plant in autumn or early winter the land should be deeply ploughed in spring and lie in a rough condition during

summer. This has the effect of sweetening the soil and making it more friable. It is advisable to plough as deeply as possible, provided that the subsoil is not brought to the surface. If the soil should be shallow and hardpan exists, it must be broken either by a subsoil plough or by a plough with the mouldboard removed following in the furrow of the first plough. If planting does not take place before spring, the preparation of the land can be delayed till autumn. The land should not be ploughed when wet; heavy land ploughed in a wet condition is seriously injured. A dressing of at least 1 ton of lime to the acre should be given in the autumn to land which is likely to be sour. Air-slaked lime is best for correcting acidity. Extra care in the preparation of land is well repaid by vigorous and fruitful plants.

Loganberries and Lawtonberries.
(The spray to the left is Mammoth Black Loganberry and to the right Lawtonberry.)

PROPAGATION.

The loganberry, as with all dewberries, propagates naturally from the tips. The tips of the canes should be covered with a few inches of soil at the end of the growing season—that is, about the beginning of May. In loose mellow soil the tips will take root readily without covering. If it is desired to produce many plants, the whole cane may be covered, when it will make roots at every node. The rooted portions

can then be removed to form plants. Another method is to pinch the strongly-growing canes about mid-summer. This will cause laterals to be produced at every node, and the tops of these will root readily. The plants obtained by the latter method are equally as strong and fruitful as those obtained from the tips of a single cane, but the cane itself which has produced these plants is not so fruitful in the season following. The loganberry can also be propagated by root cuttings and also by seed. Plants produced from seed, however, do not come true, and the fruit is invariably inferior to that of the parent plant. The single-cane plants are, on the whole, the best method of propagation, and, seeing that about 5,000 can be produced on an acre plantation, the other methods should rarely be necessary.

Mr. Murfet's Loganberry Plantation at Ringwood.

PLANTING.

In cool moist districts spring planting is recommended, but the plants should be set not later than mid-September. In the drier and warmer districts the plants may be set as soon as the tip plants can be obtained. This would probably be in early June. In the case of spring planting, the plants should be well established before the warm weather sets in.

The loganberry is usually planted 6 feet x 6 feet on the square system. Where the soil is rich and the growth likely to be vigorous, it is advisable to plant from 6 to 8 feet apart in rows 8 feet apart. This allows plenty of room for cultivation, which is desirable in the case of strong-growing plants.

When planting is done in spring, care must be taken to prevent the roots of the young plants drying out. They should be heeled in or covered with earth immediately they are received, and when taken out for planting should be protected from sun and wind by a wet bag. This is particularly necessary if the weather is at all warm.

The soil, having previously been worked to a fine tilth, the planting can be quickly done with a spade. The spade is thrust in close to the line on the farther side from the operator but pushed forward, the plant placed in position, which should be about 3 inches deeper than it previously stood, the spade withdrawn, and the earth firmed around the plant with the foot. When a large number of plants is being set, it is best to open out a furrow with the plough to the required depth. The plant is set in this, the fine soil placed around the roots and firmed, and the furrow filled by ploughing "on." A rod of the necessary length gives the distance between plants. As mentioned before, in districts where there are strong prevailing winds, it is best to have the rows running parallel with the direction of the wind.

IRRIGATION.

The loganberry delights in a rich moist soil, and, where moisture is deficient in the summer, it must be supplied. The yields of plantations near the metropolis have been increased 25 to 50 per cent. by irrigation, and all commercial growers in this district now irrigate. In the deep loams of Wandin district and those of a similar character, where the rainfall is good and the climatic conditions particularly favorable, irrigation is not so necessary, but even there, in some seasons, the plants are greatly benefited by irrigation.

The number of waterings depends largely on the season. It is important that the soil be kept moist during the time the fruit is maturing. Applications of water from every seven to fourteen days are necessary during a dry spell, according to the quantity of water used at each application and the nature of the soil. It is very necessary to cultivate the land as soon as practicable after each watering.

CULTIVATION.

For the purpose of conserving moisture, destroying weeds, and assisting in the liberation of essential plant food, tillage is, perhaps, more necessary in the case of the loganberry than with the larger fruits. The loganberry will not thrive nor be fruitful unless there is an ample supply of moisture in the soil. In the dry and warm districts of Victoria, irrigation and thorough cultivation are essential.

The implements required for cultivation depend to some extent on the nature of the soil. A single-furrow orchard plough with shifting handles is necessary to enable ploughing to be done close up to the plants.

The deeper the ploughing, in reason, the better, providing that the subsoil is not brought to the surface nor the roots of the plants injured. The deeper the soil mulch the better for conservation of moisture. The usual depth is from 5 to 6 inches, with a few furrows near the plants shallower if there is danger of injuring roots. If the plantation is ploughed deeply from the beginning, and worked regularly at that depth, there is little danger of doing damage to the roots.

Ploughing is necessary at least twice a year. In the autumn or early winter the land should be ploughed "on"—that is, the soil should be turned towards the plants, leaving a deep furrow midway between the rows. The land should lie in a rough condition during winter, and

as much of the surface as possible exposed to the ameliorating influence of sun, air, and frost. In spring, the ploughing should be "off," or away from, the plants. The centre furrow is filled by this ploughing

A General View of Mr. Harold Godwin's Berry Plantation at Wandin.

and the land left level. It is usually necessary to harrow before the spring ploughing in order to put the land in proper condition for this operation.

As mentioned before, heavy land should not be worked when too wet. For this reason the autumn ploughing should not be delayed too long nor the spring ploughing done too early.

The summer cultivation consists of harrowing and working with the spring-tooth cultivator or one-way disc. Before the trellises are erected in the first year of planting, cross working can be practised if desired. Later, when the canes grow long and spread in every direction, cultivation may be done only in one direction between the rows.

The canes, as they grow, must be trained along the ground in line with the rows so as to be out of the way of the cultivator. The different systems of training the canes and trellising will be dealt with later.

The frequency of summer cultivation is dependent, chiefly, on the season. Cultivation is necessary after heavy rain or irrigation to provide an earth mulch to prevent evaporation and the growth of grass and weeds.

More frequent waterings will not compensate for neglect in cultivation. Inexperienced growers sometimes fall into this error.

Regarding the necessity for destroying grass, &c., by cultivation, recent experiments conducted at the Woburn Experimental Fruit Farm disclosed the fact that grass, &c., not only robs the soil of moisture, but does much more harm by producing a toxin which is very harmful to the cultivated plants. The aeration of the soil by cultivation oxidizes the toxin and renders it harmless. More than this, what was previously a toxin becomes on oxidization a plant food. It was also found that on land well underdrained the toxin was mostly washed out of the soil, and consequently its injurious effects considerably lessened.

The chemical condition of a soil being dependent on its physical condition, it follows that thorough cultivation is of vital importance.

(To be continued.)

THE CARE OF HONEY WHEN STORED.

If honey is stored in a damp place, and not thoroughly sealed up, it will absorb moisture, and if excessive moisture is so taken up the honey is liable to ferment and deteriorate in value. Do not leave the lid off the containers, or leave honey exposed for any length of time during the late autumn and winter months. If kept in a dry place in a sound container honey will keep good for years; it may granulate, but that is not a sign of deterioration, and in such case it may easily be liquefied by immersion of the container in hot water. Honey containing excessive moisture, in contact with the atmosphere and in a tinned container, will often be stained, as the liquid then has a tendency to absorb some of the tin—an event usually indicated by a dark streak. Let the apiarist have his honey well ripened naturally by the bees and stored in a sound container in a dry place, and he will experience no trouble.—W. A. GOODACRE, Senior Apiary Inspector, in the *Agricultural Gazette* of New South Wales, June, 1920.

AGRICULTURAL DISPLAY AT THE SPECIAL SHOW

TO CELEBRATE THE VISIT OF H.R.H. THE PRINCE OF WALES.

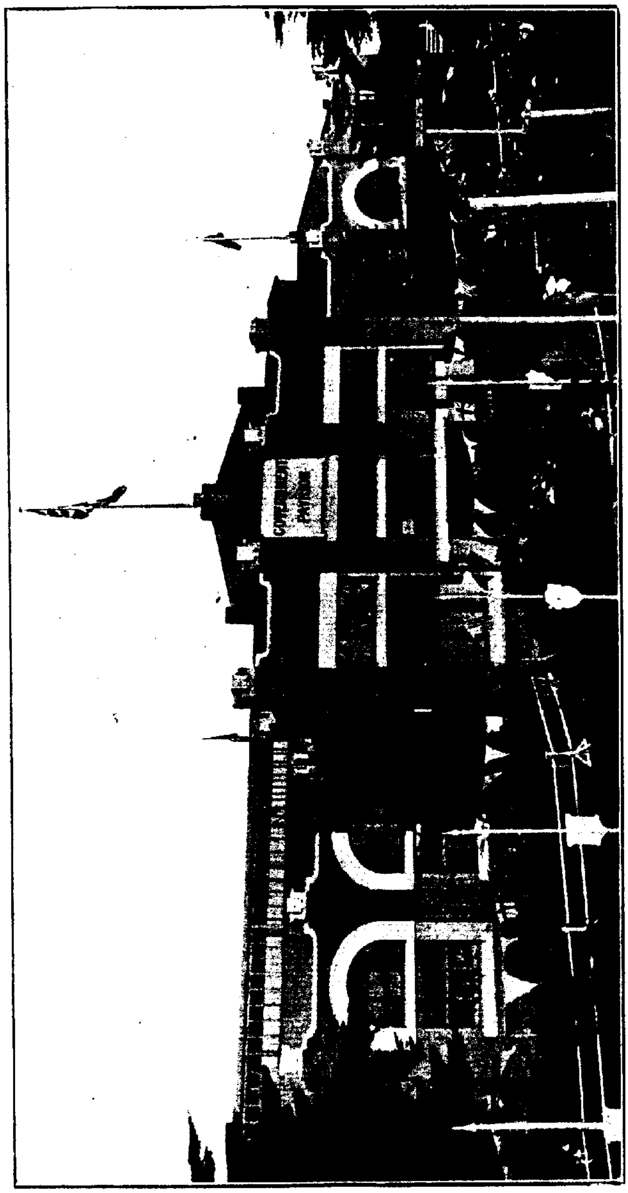
On the occasion of the visit of His Royal Highness The Prince of Wales to Australia, the Royal Agricultural Society of Victoria arranged a Show on the 29th May, so that the Prince might have an opportunity to see some of the best of the various classes of live stock and samples of the chief primary products of the State.

The Department of Agriculture was intrusted with the making of a display of products of the soil in the Government Pavilion. Samples of nearly all the Australian primary products, the total production of which represent an annual value of £188,500,000—including £48,000,000 for Victora—were shown. The Department was materially assisted by the State Wool Committee, which staged some of the finest greasy and scoured wool of all classes produced in the world. It is perhaps worth mentioning here that the number of sheep in Australia totals 84,965,000, and of these about 16,000,000 belong to Victoria. The wool produced last year was 2,025,456 bales, including 600,968 for Victoria; valued at £45,515,675 and £13,313,839 respectively. The Bacchus Marsh Agricultural Society displayed a collection of products, showing the large variety of commodities which can be produced in one district of the State. The Western and Murray Districts Co-operative Bacon Curing Company Ltd. made a most creditable contribution of bacon and pig products. Pig raising is undoubtedly a promising and profitable industry, especially when carried on with dairying or mixed farming, and should be capable of great development. The Australian Dried Fruits Association placed on view an excellent collection of dried fruits, the "Sunraysed" exhibit comprising sultanas, currants, apricots, peaches, and other kinds of dried fruits and products. Messrs. Bennet and Woolcock, wholesale and retail butchers, contributed the meat shown in the glass freezing chamber, giving the public some idea of the state in which 4,000,000 carcasses of mutton and lamb exported from Victoria this year were sent away. Besides mutton and lamb, the firm exhibited specimens of frozen beef, pork, and sundry meats. Messrs. Raphael and Coy and D. Hyland and Sons Pty. Ltd. supplied an exhibit of poultry—turkeys, chickens, &c. These exhibits, together with others supplied from private sources, were the best of their several kinds. They were all most tastefully displayed, and materially supplemented those of the Government Departments.

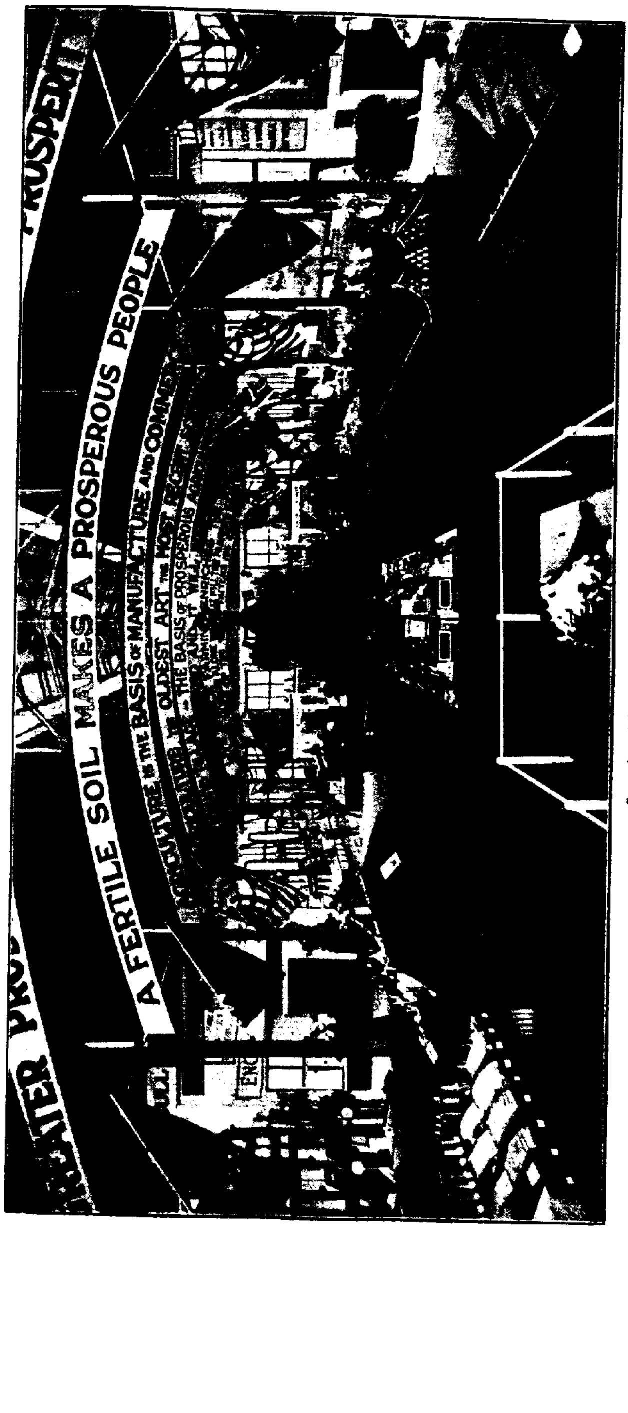
The Forestry Department arranged timbers in raw and manufactured form, showing the value and beauty of woods grown in the State, together with by-products, including extracts, &c., the latter being supplied by Cumiing, Smith, and Co. Pty. Ltd. Up till a few years ago, most of the material for building and furniture-making was imported from other countries; now, the suitability and value of local timbers are generally recognised. With proper seasoning and treatment, the native woods have proved eminently adapted for all purposes.

The Dookie and Longerenong Agricultural Colleges showed products of their respective farms and work of the students, giving a good idea of the scope of their operations and educational work.

The Werribee Research Farm staged grain and other products of the farm, illustrating the extensive nature and value of the work carried out there.

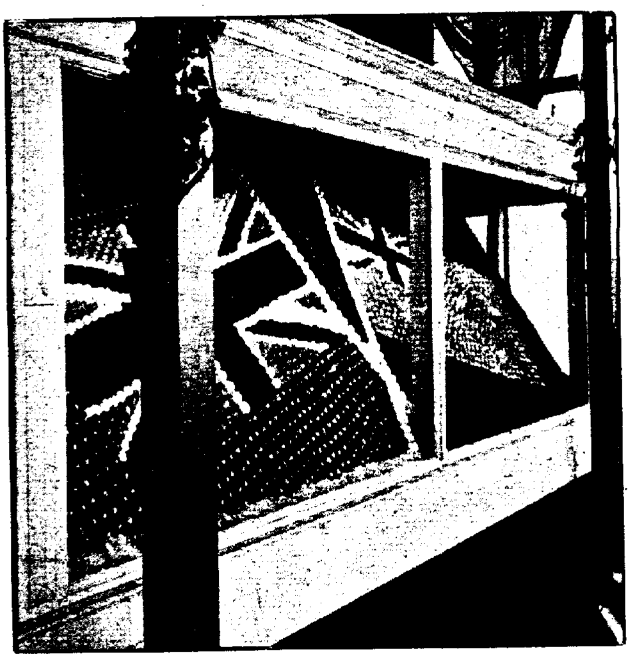


The Arrival of the Prince of Wales.

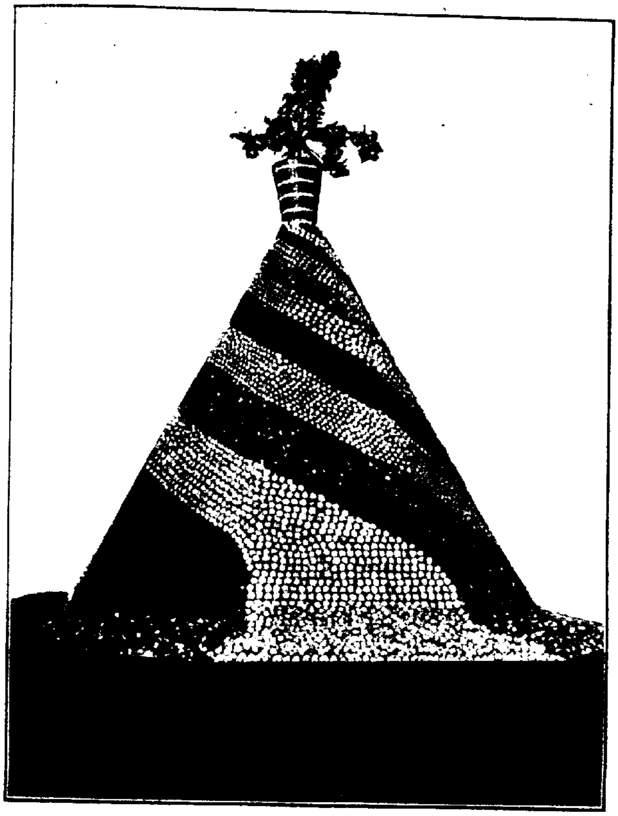


Interior View of the Government Pavilion.

Portion of Wool Exhibit Staged by State Wool Committee.

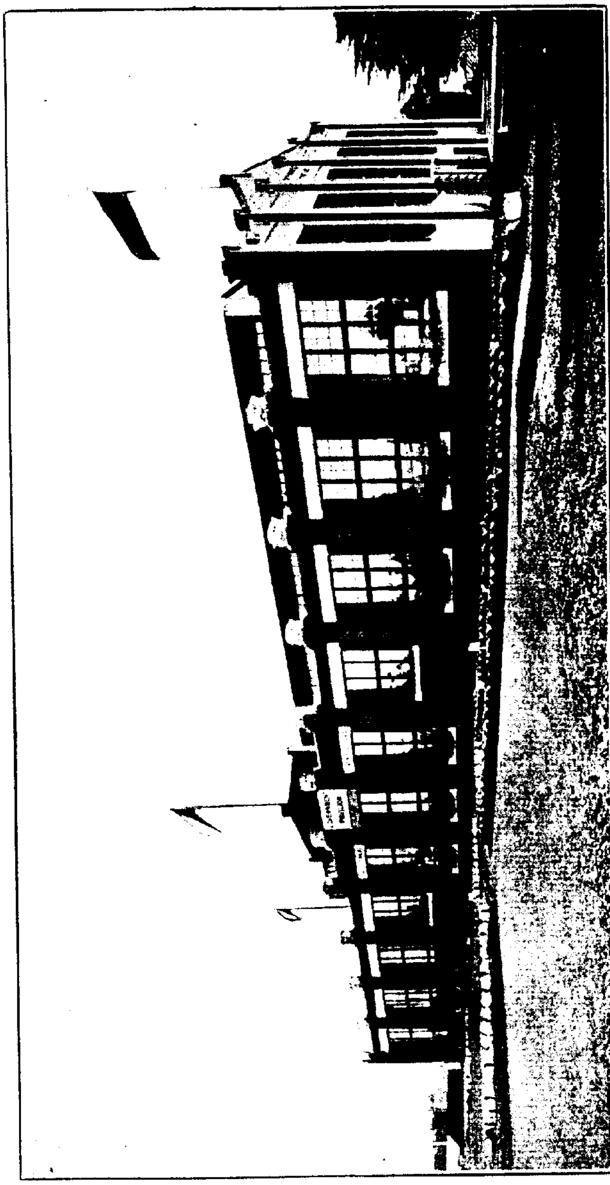


Apples in the Glass Cool Chamber.



A Pyramid of Fruit.

The Tobacco Exhibit.



Back View of the Government Pavilion.

Fruit.

Fruit occupied the central trophy in the shape of a pyramid, surmounted by a well-laden orange tree. The octagonal-shaped pyramid was furnished with eight varieties carried spirally to the summit, the whole symbolizing prolific abundance. In the glass cool chamber the fresh fruit display was supplemented and worked out in designs showing the Union Jack and the Australian flag. About 5,500,000 bushels of fruit are produced in the State of Victoria, representing nearly 37 per cent. of the fruit grown in the whole of Australia. Since the Show a cable has been received intimating that Victorian fruit has been awarded the Banksian Medal by the Royal Horticultural Society. The winning apples were shown in competition with entries from all the British Dominions, and their success indicates that Australia is capable of producing fruit equal to that of any other part of the world. All kinds of bottled fruit, jams, jellies, pickles, &c., in preserved form were also displayed, and made a most attractive exhibit.

Viticulture.

One of the most striking features in the Pavilion was the vines on all the pillars laden with different varieties of grapes. These grapes had been held in cool storage since the fruit season. In the special section of the viticultural branch three main activities of the vine industry were shown, viz., fresh grapes, dried grapes, and wine, the last named being represented by a trophy of bottles bearing the labels of leading Victorian wine merchants. When the Prince reached this part of the Pavilion, he was invited to taste a couple of choice old wines selected for the occasion by the Viticultural Society of Victoria. He very graciously consented, and commented most favorably on the quality of the wines, which were Yeringberg, White Hermitage, and a Sunbury Red Hermitage, of 1900 and 1874 vintages, respectively.

The wine shipments to Great Britain have steadily increased during the past thirty years, and prospects were never brighter than at the present time. The 40 per cent. Tariff preference recently given our wines on entry into Great Britain should greatly assist in making Australia the supplier of most of the wine required by the Mother Country, which her climate does not permit to grow herself, thus justifying the name of "John Bull's Vineyard." This was the title prophetically given to a little book by the late Hubert de Castella, describing Victorian viticulture at the time of the Royal Colonial and Indian Exhibition held in London in 1886. A copy of this work, which was dedicated to the then Prince of Wales (afterwards King Edward VII.), was presented to His Royal Highness by Mr. F. de Castella, son of the author, who remarked that his father's prediction seemed to be in a fair way towards realization.

Tobacco.

The exhibit of tobacco leaf grown and cured in Victoria evidenced the marked development as compared with the leaf shown in previous years, the most important improvement being in cigarette and bright plug tobaccos; nice quality samples of cigar leaf were also on exhibition.

There appears to be a good prospect of large quantities of good cigar filler leaf being produced in Victoria now that proof has been given of these crops' suitability to certain soils and climates of the

State. Recent improvement is due chiefly to the attention to more up-to-date varieties suited to local conditions, and better systems of treatmen . Prices for the local product have risen during the past five years from 6d. and 1s. per lb. to 3s. per lb. for leaf, and there seems every likelihood of prices rising still higher in the near future. The world's supply of raw material was barely keeping pace with the demand before the war, during which many tobacco-producing countries were greatly interfered with as suppliers.

Australia at the present time produces only 12 per cent. of the tobacco manufactured locally, and there is no reason apparent why she should not supply nearly the whole of her requirements in the near future, and establish an export trade for tobacco leaf.

Potatoes and Onions.

In the *Journal of the Board of Agriculture* in March, 1919, the following paragraph appeared, viz.:—

> "Of the crops other than cereals which exercised an important influence on the course of the war, the potato is the chief; indeed, in some ways the potato may be said to have been the most impor ant of all crops, for without it Germany could not have carried the war into the fifth year. With the single exception of sugar beet, more food can be produced per acre by the potato than by any other commonly cultivated food plants."

A photo. was displayed on the potato exhibit, showing a crop in Victoria this year which yielded 18 tons to the acre.

About 60,000 acres produce within the State from 200,000 to 240,000 tons on an average, having a gross value of £1,250,000 to £1,500,000.

Victoria is by far the greatest potato-producing State of the Commonwealth, whence all the other States, excepting Tasmania, draw large quantities.

Poultry.

A hen was shown which made the world's official record in one year by laying 335 eggs, and poultry of all kinds was displayed in the glass freezing chamber. Eggs were also shown in cool chamber, arranged to show the Prince's Feathers with white eggs on a brown egg ground, and the badge of the A.I.F. with brown eggs on a ground of white eggs. These designs were most attractive. The annual production in the State of Victoria has now reached £2,500,000 for eggs and table poultry.

Dairy Produce.

One of the leading staple industries in the State is dairying, and butter and cheese occupied a cool chamber, whilst milk products furnished a stand. Over 600,000,000 gallons of milk are produced in the Commonwealth yearly. The milk consumed and the butter, cheese, and milk products manufactured have a total value of about £20,000,000.

Included in the milk products section were dried milk, concentrated and condensed milks, casein, milk sugar, and combs, &c., produced from casein. An interesting feature was a 10-gallon can and products which that quantity of average quality milk would produce in the shape of butter, cheese, pork, or veal; dried, concentrated, or condensed milk, casein, and milk sugar, &c.

Fibres.

Flax growing may be classed as one of the minor industries, but under the stimulus of present values has recently made, and probably will continue to make, reasonable progress, for much of our soil, as well as our climate, especially near coastal districts, is eminently suitable for its production for both fibre and seed purposes.

Shown on the table allotted to this section were samples of Irish flax, each marked according to European grade and value, samples of the Victorian-grown product taken from various parts of the State, and several bundles representative of consignments recently sold in England; these are amongst the first so marketed, and it was interesting to note that the quality of the local commodity compared very favorably with the better grades of the imported, and it is encouraging to know that the prices obtained for the exported lots referred to were highly satisfactory.

To induce the cultivation of flax on a larger scale and the erection of the necessary scutch mills, the Commonwealth Government has guaranteed growers a minimum price for three years, in addition to which they are to participate in the profits derived from its manufacture and sale, which it is anticipated will add materially to the guaranteed figure.

During the past three years the area cultivated has increased from 600 to approximately 2,000 acres, and there is every reason to believe that as a result of the Government guarantee the area within the near future will be considerably added to.

Grain and Flour.

The wheat industry is one of the main sources of Victoria's agricultural wealth. During the war period Victoria has raised over 200,000,000 bushels of wheat, which was worth to the State approximately £40,000,000. The acreage under cultivation has declined somewhat during the war owing to difficulties and shortage in overseas transport. In view of the world shortage of this cereal, prices have rapidly advanced, and it seems certain tha the wheat-growers will receive highly satisfactory prices for their product for the next few years. The Department of Agriculture inaugurated a wheat campaign during the past autumn with highly gratifying results. Despite the absence of early soaking rains, there has been a considerable increase in area, and it appears probable that the area under crop this year will approximate 3,000,000 acres.

The exhibits of grain comprised a collection of bulk samples of the leading varieties of wheat grown in Victoria, together with a collection of offals and flour from each variety. The milling of each variety of wheat was illustrated by the use of specimen jars filled with products of each variety.

Sugar.

A fine collection of products of the Maffra factory was exhibited. Despite many drawbacks, the Maffra Sugar Factory—the only beet-sugar factory in Australia—has made headway, and has now emerged to the profit-making stage.

Beet is one of the most profitable crops to grow, as it produces more food per acre than any other crop, and vastly improves the agriculture of any district in which it is grown. The collapse of the beet industry

in Central Europe through the war, and the shortage of cane sugar, have caused world prices for this commodity to rise considerably. The success of the beet factory at Maffra seems now assured.

General.

The Government pavilion was erected at the Royal Society's Show Grounds three years ago at a cost of £10,000, and is utilized at the annual September show by the Department of Agriculture for the exhibit of products of the State and giving information to producers, and illustrating best methods of production. No finer collection of exhibits has been put together than on the occasion of the Prince's visit; and the Prince, before leaving, congratulated the officers on the comprehensive and attractive display.

FARM NOTES FOR MAY, 1920.

STATE RESEARCH FARM, WERRIBEE.

H. C. Wilson, Manager.

The Season.

The steady timely rains through the month have completely altered the prospects of the season of this district, and after the trying times experienced during the past six months stock-owners and farmers are jubilant at the favorable turn the season has taken.

The rain recorded for the first five months of the year has been as under:—

January	125	points.
February	30	,,
March	77	,,
April	126	,,
May	222	,,
Total	580	points.

During the months of April and early May the fallows of the farm were partly seeded; this was before the heaviest autumn rain fell. 350 acres of wheat and oats mixed for hay was sown in a dry seed-bed; also 200 acres of seed wheat. Following on the 180 points of rain during the second week of May, germination of these early-sown areas has been extremely good, and very little loss by mould or malting has resulted, as was at one time feared.

Seeding.

During the month of May 60 acres of barley for grain, 100 acres of oats for hay and grain, and the bulk of the experimental seeding has been completed.

The total autumn seeding for the year to the time of writing is as follows:—

Date.	Paddocks.	Crop.	Acres.	Manure per acre.	Seed per acre.	Cultivating System.
April 1–4	Hearts paddock ..	Hay	60	120 lbs. superphosphate	Algerian oats, 45 lb. Warden wheat, 45lb	Winter fallow
April 5–20	New leased land ..	Hay	210	120 ..	F. K. 45 lb., Algerian oats, 75 lbs.	,,
April 21–25	Old leased land ..	Grain	60	120 ..	Algerian oats 25 lbs.	..
April 26–28	.. ,, ..	..	50	120 ..	Warden seed wheat, 60 lbs.	..
April 25 – May 3	No. 9 N.E. ..	Green Feed	62	56 ..	Barley (Oregon Cape), 35 lbs.	Green ploughing
April 28–30	Old leased land ..	Grain	40	120 ..	Federation, 60 lbs...	Winter fallow
May 3–4	,, ,, ..	,,	30	120 ..	Y. King, 60 lbs. ..	,,
May 3–10	No. 14 S.E. ..	Silage	45	120 ..	Barley (Oregon Cape), 65 lbs.	Green ploughing
May 5–6	Old leased land ..	Grain	30	120 ..	Gallipoli, 60 lbs. ..	Winter fallow
May 6–7	,, ,, ..	..	30	120 ..	Major, 60 lbs. ..	,,
May 20–24	,, ,, ..	..	20	120 ..	Currawa, 60 lbs. ..	..
May 21–28	No. 10 N.E. ..	Hay	62	156 ..	Algerian oats, 45 lbs. Graham wheat, 45 lbs.	.. Rape fallow
May 28 – June 3	North Blue Gum..	Grain	30	120 ..	Algerian oats, 65 lbs.	Summer fallow
May 24 – June 3	No. 8 N.E. ..	Stud Wheat	60	120 ..	Wheat experimental and varieties	Early winter fallow
..	Experimental fields	Exp.	70	Varying quantities	Varying quantities..	Fallow
		Total	829	Acres		

Wheat and Oats Mixture of Hay.

It has always been our custom to provide adequate fodder reserves for the stock of the farm as a protection against drought conditions. The mixture of hay which has been sown on the farm for the past eight years is as follows:—

Forty-five lbs. of Warden wheat and 45 lbs. of Algerian oats per acre with 120 to 156 lbs. of superphosphates sown on well worked winter fallow. The grain should be thoroughly graded and mixed before seeding. The hay from the mixture is highly palatable, contains a thoroughly balanced food ration, and gives a better yield than that from hay crops of either wheat or oats alone.

Winter Fodder Crops for Sheep.

There is no more serious time to the flock owner in this district, particularly where lambs are being bred, than the months of May, June, and July. Throughout these months native root grasses are very poor and unpalatable, and autumn-grown feed is very scant on land which has been previously cultivated. It is essential, if it is desired to run a maximum number of well-fed sheep on a farm, that the owner should make some provision for these winter months of scarcity.

Dwarf Essex rape, sown on green ploughed land in March, at the rate of 4 lbs. of seed per acre with ½ cwt. of superphosphate, often gives in this district very profitable returns, particularly when the rains in autumn fall early. Land carrying crops of this kind can be fed off to flock ewes and lambs during winter months. In the spring it may be heavy disc-cultivated, and will yield crops of hay or grain equal to those sown on early winter bare fallow. It is also profitable

to sow barley for sheep during the winter months, if the fields be thoroughly and deeply disc-cultivated before the hot summer months bake the surface of the land and dry the conserved winter moisture.

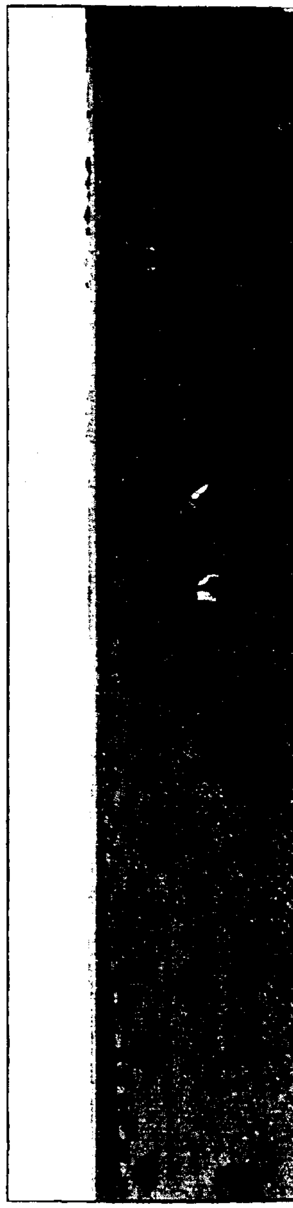
Feeding-off early sown hay and grain crops has also been practised, and can be adopted if the stock are moved when heavy rains fall, and the crop allowed to grow without further feeding after the last week in July. Winter feed of this kind can be valued at a very high figure if the flock-owner is desirous of selling his lambs at the early markets in August or of topping-off aged sheep for winter mutton.

Irrigated Lucerne and Pastures.

The winter grazing value of the lucerne and sown grasses on the irrigation areas of this farm is very high. Stock-carrying tests conducted during the past three years have proved that on an average five dry sheep to the acre may be fattened on them in the months from May to September. In the case of breeding ewes with lambs at foot, four to the acre have been carried, but it has been necessary to stock somewhat lighter than this when the lambs were to be fattened on the mothers during the months of late July and August. The irrigated areas should be subdivided so as to permit of quick changes from paddock to paddock, the flocks being left not longer than a fortnight on any one field, thus allowing the lucerne to shoot again from the crown, and giving the stock a change from time to time, which results in better feeding and maturing of the young lambs.

Winter Renovation of Lucerne.

In view of the high prices obtained in this district for lucerne hay this season and the prospects ahead, particular attention is to be given to these irrigated areas during the months of July and August.



A 500-acre Paddock of Shandy Hay at the State Research Farm (average 3½ tons per acre).

Surface drainage of low-lying patches is of vital importance to successful renovation. The whole of the lucerne areas will be heavily grazed until the middle of August, when a rigid, tined, fine-pointed cultivator will be worked to a depth of 3 inches, followed by fertilizer drill, sowing 2 cwt. of superphosphate per acre. The land will then be finally rolled in preparation for first cut of hay, which should be harvested in late September or early October. Our experiments here have proved that the winter cultivation and top dressings increases the hay yield of the area so treated from 18 to 20 cwt. per acre, which means in a season similar to that just past, an extra return of from £8 to £10 per acre for an outlay of approximately £1 per acre. Nitrogenous and potassic and general manures have also been tried, but without the result obtained from superphosphate. Lime top-dressing on the lucerne has proved to be profitable, but has by no means shown the returns on the invested outlay that superphosphate has given. The second dressing of phosphate manure could be profitably applied in mid-summer months after the second or third cutting.

Ewes and Lambs Feeding Off Early-Sown Hay Crop, State Research Farm, Werribee.

Live Stock.

Prospects in the district for the flock-owner have considerably improved during the present month, but pastures are scarce, and the cold weather is preventing their rapid growth. Lambing is in full swing in most parts of the locality, but the percentages do not promise to be high. All the stock on this farm are in particularly good condition owing to our adequate forage reserves.

Cattle.—The dairy herd, 60 in all, comprising 53 head of Red Polled and 7 Friesian, are in excellent condition; 148 gallons of milk per day is now being obtained from the dairy herd. A mixture of silage lucerne, hay and bran, comprises the main winter ration of the herd.

Horses.—Fifty-four working horses have been continually employed during the past month at heavy seeding operations, maintaining their condition well on good shandy-hay chaff.

Sheep.—The following sheep are at present being grazed on the pastures and irrigated areas of this farm:—

Merino Lincoln cross four-year-old ewes ..	600
Lambs at foot by Suffolk rams	510
Stud Suffolk flock	85
Stud Border Leicester flock	260
Mixed weaners and sheep as rations	40
Total	1,495

During the month of May, 510 lambs were marked; the lambs are now doing well, and it is anticipated that the first draft will be available for market toward the end of July. These early lambs are the result of mating 6 two-tooth Suffolk and 6 two-tooth Border Leicester rams with 600 four-year-old Lincoln cross Merino ewes. Lambing started the first week in April, and it has been interesting to note that of the 510 lambs marked, no less than 470 were by the Suffolk rams, and 40 only by the Border Leicester. This shows the vigorous tendencies of the Suffolk breed.

Soldier Trainees.

Twenty returned men are undergoing training in practical farming. During the month of May a few completed their course, and were granted certificates by the Qualification Committee; new men have replaced these on the farm. It has been gratifying to have seen some of the past trainees visit the farm during the month, and hear reports of their satisfactory settlement on land of their own, many of whom through their enthusiasm and industry will undoubtedly be successful.

STANDARD TEST COWS.

Report for Quarter ended 31st March, 1920.

One hundred and twenty-four cows completed the term, only fourteen of which failed to qualify for certificates. Individual returns are as follow :—

W. K. ATKINSON, Swan Hill. (Shorthorn.)

Completed during the quarter, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Roan Daisy	Not yet allotted	*11.5.19	273	22½	7,779	4·75	369·60	250	421¼

* Calved six weeks prematurely.

J. BAKER, Gheringhap. (Red Poll.)

Completed during the quarter 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Echo Maid	Not yet allotted	2.4.19	273	7	5,941	5·34	317·47	250	361¾
Karong Belle	..	5.4.19	273	16½	6,817	5·34	364·30	250	415¼
Karong Rose II. ..	..	9.4.19	273	16½	5,078	4·15	210·79	175	240¼

F. BIDGOOD, Staghorn. (Jersey.)

Completed during the quarter, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Clementine of Staghorn ..	5592	2.4.19	*270	8	2,913	6·46	188·28	175	214½
Fox's Clementine II. ..	4721	23.6.19	273	15½	6,471	5·64	364·80	250	415¾

* Withdrawn before completion of test

Mrs. AGNES BLACK, Noorat (Jersey)

Completed during the quarter, 2. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Mona's Pearl	3577	*14.4.19	273	11	6,569	4·72	310·02	250	353½

CALLERY BROS., Bannockburn. (Ayrshire.)

Completed during the quarter, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Rose Royal of Langley Park	2841	3.4.19	273	12	6,564	4·90	321·43	250	366½
Sunflower of Langley Park..	4954	2.5.19	273	8	4,024	4·43	*178·60	175	203½

J. W. COCHRANE, Moorabbin. (Ayrshire.)

Completed during the quarter, 2. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Heatherbelle of Springfield..	4970	18.6.19	273	20½	8,102	4·12	333·54	250	380¼

DEPARTMENT OF AGRICULTURE, Werribee. (Red Poll.)

Completed during the quarter, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Mongolia..	Not yet allotted	25.3.19	273	20	9,245	4·11	380·03	250	433¼
Morocco	"	26.5.19	273	36½	10,024	3·60	361·20	250	411¾

DICKINSON BROS., Sebastopol. (Friesian.)

Completed during the quarter, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Phoebe of Ashby	Not yet allotted	18.6.19	273	20	6,060	4·20	254·87	175	290½

C. FALKENBERG, Elliminyt. (Jersey.)

Completed during the quarter, 3. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Hope V.	2890	8.5.19	273	15	6,330	5·27	330·86	250	387¼
Lady Merlin of Colac ..	5890	8.5.19	269	4	3,519	5·70	200·65	200	228¾

FLACK AND SEWELL, Berwick. (Friesian.)

Completed during the quarter, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Dominion Queen Mercedes ..	Not yet allotted	13.5.18	273	27½	10,295	3·42	352·02	175	401¼
Homestead Maggie ..	..	21.6.19	273	23	9,180	3·60	330·48	250	376¾

G. GANGE, Junr., Mininera. (Ayrshire.)

Completed during the quarter, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Gardenia of Seafield ..	5141	29.3.19	273	13	6,311	4·47	282·01	250	321½

GEELONG HARBOR TRUST, Marshalltown. (Ayrshire.)

Completed during the quarter 4. Certificated, 4.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Frolic of Sparrovale ..	2874	8.4.19	273	17½	8,371	4·02	335·77	250	384
Maid of Sparrovale ..	3900	19.4.19	273	18½	6,536	4·85	317·36	250	361¾
Gipsy Girl of Sparrovale ..	3894	28.4.19	273	9½	7,601	4·89	371·95	200	424
Sybil of Sparrovale ..	3907	11.5.19	273	19½	6,919	4·50	311·24	175	354¾

T. HARVEY, Boisdale. (Jersey.)

Completed during the quarter, 4. Certificated, 4.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Lady Marge of Jerseyholm	4981	27.5.19	273	16	7,339	6·09	447·21	250	509¾
Kirsty VII. of Jerseyholm ..	5918	8.6.19	273	13	5,721	5·79	331·05	175	377¼
Kirsty VI. of Jerseyholm ..	4980	9.6.19	273	16½	7,173	6·23	447·27	200	509¾
Sparkle II. of Jerseyholm ..	5920	9.6.19	273	13¾	5,204	5·85	304·37	175	347

J. H. HUNTER, Tyntynder South. (Jersey.)

Completed during the quarter. 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Trixie of Tarnpirr	5173	21.4.19	273	21	7,430	6·15	457·14	200	521¼
Ringtail of Tarnpirr ..	5170	21.5.19	273	10	5,002	5·64	287·29	200	327¼

J. HUTCHINSON, Somerville. (Jersey.)

Completed during the quarter, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Audrey of Somerville ..	5946	3.4.19	273	25	8,395	4·92	412·82	200	470¾
Valdean of Somerville ..	5949	26.4.19	273	12¼	5,054	5·20	262·83	175	299¾
Princess Victoria of Holmwood	5152	1.4.19	273	27	11,071	5·01	554·61	250	632¼

A. JACKSON, Glen Forbes. (Jersey.)

Completed during the quarter, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
Creamy of Lesterfield ..	Not yet allotted	14.5.19	*263	lbs. 16	lbs. 6,951	4·78	lbs. 332·11	lbs. 200	lbs. 278½

* Withdraw before completion of term.

S. A. JOHNSON, Woodend. (Ayrshire.)

Completed during the quarter, 1. Certificated, Nil.

A. W. JONES, Geelong. (Friesian and Jersey.)

Completed during the quarter, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
			Friesian.						
Her Royal Highness ..	Not yet allotted	28.3.19	273	32	9,981	3·56	355·11	175	404¼
			Jersey.						
Lady Grey I. of St. Albans ..	4186	20.6.19	273	20	8,679	6·10	520·34	250	603¾

GEO. KENT, Archie's Creek. (Ayrshire.)

Completed during the quarter, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
Winsome of Woolamai Park	5276	9.5.19	273	lbs. 12¼	lbs. 6,257	4·31	lbs. 269·55	lbs. 175	lbs. 307¼

C. G. KNIGHT, Cobram. (Jersey.)

Completed during the quarter, 7. Certificated, 7.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Silver Bell	6038	29.3.19	*249	15¼	5,073	5·59	284·00	200	323¾
My Hope of Kameruka ..	6032	29.3.19	*249	18	6,531	5·09	334·84	175	381¾
Ros.l af of Tarnpirr ..	6037	31.3.19	*247	14	5,252	6·24	327·77	175	373½
Lady Choice of Tarnpirr ..	5160	25.5.19	273	10	7,897	6·00	474·26	200	540¼
Idyll's Ideal	2096	29.5.19	*188	24½	6,144	4·62	283·89	250	323½
Bonnie II. of Tarnpirr ..	Not yet allotted	13.6.19	*174	15½	3,281	6·24	204·74	175	233¼
Nimitabel of Kameruka ..	6033	17.6.19	*163	21	5,546	5·1?	285·54	200	325½

* Sold before completion of test.

J. A. LANG, ALVIE. (Ayrshire.)

Completed during the quarter, 5. Certificated, 4.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Esme of Inverkiel ..	3155	9.4.19	273	4	7,180	3·97	285·46	250	325½
Esme of Riccarton ..	Not yet allotted	16.4.19	273	7	6,616	3·96	261·78	175	298½
Dime of Riccarton ..	„	16.4.19	264	4	5,411	4·75	256·86	200	292¾
Milkmaid of Riccarton ..	„	8.6.19	273	9	6,169	4·49	277·48	175	316½

AGRICULTURAL HIGH SCHOOL, Leongatha. (Jersey.)

Completed during the quarter, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Surprise	Not yet allotted	18.4.19	273	16½	4,712	6·45	303·90	175	346½
Alice	„	18.5.19	273	13½	4,996	6·30	314·83	175	358¾

H. LIDGETT, Myrnlong. (Shorthorn.)

Completed during the quarter, 6. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Hillfield Duchess 19th ..	Not yet allotted	28.3.19	273	13	6,872	4·03	277·12	175	316
Duchess of Pentland 26th ..	„	28.3.19	273	14	5,930	3·92	232·00	175	264½
Montrose II.	„	7.5.19	273	17	9,239	4·42	408·16	250	465¼

C. G. LYON, Heidelberg. (Jersey.)

Completed during the quarter, 7. Certificated, 7.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Starfinch II.	2915	28.3.19	273	30	8,560	4·83	413·78	250	471¾
Hawthorn IV. of Banyule ..	5207	14.4.19	273	28	8,190	5·98	489·63	250	558
Soprano II.	6081	16.4.19	273	18	5,484	6·07	332·97	175	379½
Silvermine XVII. of Banyule	6079	2.5.19	273	14½	4,653	4·90	228·10	175	260
Hawthorn VII. of Banyule..	6068	30.5.19	273	13	5,443	5·51	300·14	175	342¼
Soprano	1395	1.6.19	273	11	5,384	5·76	310·42	250	353¾
Hawthorn VI. of Banyule ..	5209	4.6.19	273	8¼	5,240	4·99	261·68	200	298¼

T. MESLEY, Dalyston. (Jersey.)

Completed during the quarter, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Little Queen	5240	26.5.19	273	18¼	6,880	5·46	375·90	250	428¾
Fairy Belle of Warenda ..	5241	26.5.19	273	12½	5,138	6·26	321·70	250	366¾

J. MITCHELL, Sandford. (Red Poll.)

Completed during the quarter, 2. Certificated, Nil.

H. C. MONCKTON, Whittington, Geelong. (Jersey.)

Completed during the quarter, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter
				lbs.	lbs.		lbs.	lbs.	lbs.
Peerless XII. of Melrose ..	6309	8.5.19	273	16	6,259	5·99	374·78	200	427¾

R. RALSTON, Moglonemby, Euroa. (Ayrshire.)

Completed during the quarter, 9. Certificated, 8.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Lady Mary of Ben Kell ..	3050	20.4.19	272	4½	6,483	4·93	319·67	250	364½
Dairymaid of Ben Kell ..	3048	20.4.19	273	16	7,322	4·60	337·08	250	384¼
Isabelle of Ben Kell ..	4577	23.4.19	228	4	4,827	4·22	203·66	200	232
Pearl of Ben Kell ..	3052	27.4.19	273	10¼	7,560	4·45	336·73	250	383¾
Poppy of Ben Kell ..	4584	19.5.19	273	4	6,131	5·29	324·23	175	369¾
Bud of Ben Kell	4571	12.6.19	232	4	5,394	4·55	245·75	200	280
Wee Edna of Ben Kell ..	3056	16.6.19	214	3½	6,066	4·20	254·89	250	290¼
Pearline of Ben Kell ..	4583	24.6.19	221	5½	4,142	4.49	186·15	175	212¼

C. D. READ, Springhurst. (Jersey.)

Completed during the quarter, 21. Certificated, 21.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Art of Springhurst ..	6199	29.3.19	273	9½	5,407	4·55	246·09	175	280½
Infanta of Springhurst ..	5396	30.3.19	273	9	5,763	5·20	299·92	250	341¼
Camellia of Springhurst ..	6200	1.4.19	273	10¼	4,690	5·61	263·20	175	300
Begum of Springhurst ..	5388	2.4.19	273	10	5,439	5·55	302·18	175	344½
Science of Springhurst ..	6207	5.4.19	273	11	3,753	5·38	201·91	175	230
Acacia of Springhurst ..	6198	7.4.19	273	13½	4,487	5·02	225·40	175	257
Crocus of Springhurst ..	5393	7.4.19	273	13	6,421	5·74	368·62	250	420¼
Anemone of Springhurst ..	5386	8.4.19	273	17½	5,983	4·99	298·63	200	340¼
Banksia of Springhurst ..	5387	8.4.19	*270	10¼	5,964	5·70	340·27	250	387¾
Princess Royal of Springhurst	5403	15.4.19	273	17½	5,552	6·02	334·29	200	381
Cobaca of Springhurst ..	4379	18.4.19	273	9¼	7,047	4·86	342.66	250	390½
Nightshade of Springhurst ..	3707	22.4.19	273	16½	8,589	4·90	421·02	250	479¼
Ixia of Springhurst ..	5397	15.5.19	273	10½	6,667	4·66	310·77	175	354¼
Lucerne of Springhurst ..	5399	19.5.19	273	10½	6,156	5·43	334·22	200	381
Brighton Princess of Springhurst	5391	25.5.19	273	6¼*	5,327	5·06	269·76	200	307½
Columbine of Springhurst ..	5392	31.5.19	273	7½	4,646	5·56	258·13	200	294¼
Wattle of Springhurst ..	5408	1·6.19	273	5½	5,529	5·27	291·54	250	332¼
Seaweed of Springhurst ..	6208	6.6.19	273	6½	4,226	5·33	225·48	175	257
Trefoil of Springhurst ..	4395	10.6.19	265	4	4,558	5·48	249·77	250	284¾
Belladonna of Springhurst ..	5389	14.6.19	273	7	5,547	4·57	253·35	200	288¾
Fleur-de-lys of Springhurst ..	5394	17.6.19	273	6	6,863	4·82	330·92	200	377¼

* Withdrawn before completion of term.

C. J. REID, Devenish. (Jersey.)

Completed during the quarter, 1. Certificated, Nil.

F. W. SADLER, Camperdown. (Shorthorn.)

Completed during the quarter, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Rosetta III.	Not yet allotted	30.3.19	273	19	7,808	3·92	305·80	175	348½
Poplar Vale Princess 35th ..	"	28.5.19	273	9½	5,518	3·93	216·72	175	217

SADLER BROS., Noorat. (Ayrshire.)

Completed during the quarter, 7. Certificated, 6.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Esme of Yalart	5839	2.4.19	*241	11½	6,543	3·66	239·28	200	272¾
Lesbia of Yalart	3189	4.4.19	273	13	7,363	4·24	312·23	250	356
Ruffy of Ecclefechan ..	2086	15.4.19	273	8½	6,855	3·85	264·03	250	301
Agate of Yalart	5832	18.4.19	273	10	5,553	3·83	212·58	260	242¼
Lady Burnbrae	4612	27.4.19	272	13	7,604	4·22	320·63	250	365½
Lenore of Ecclefechan ..	2692	26.6.19	273	17¼	7,573	4·33	327·79	250	373¾

* Withdrawn before completion of term.

AGRICULTURAL HIGH SCHOOL, Sale. (Ayrshire.)

Completed during the quarter, 2. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Gladys of Ellerslie ..	4810	30.4.19	73	13	6,347	4·65	295·48	250	336¾

A. H. SCHIER, Caldermeade. (Ayrshire.)

Completed during the quarter, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Countess II. of Pine Grove	4627	22.4.19	273	7½	4,636	4·71	218·54	200	249¼

H. STONE, Baldwyns. Cohuna. (Shorthorn.)

Completed during the quarter, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Baldwyn's Cherry ..	Not yet allotted	25.5.19	273	7	7,537	4·06	306·44	250	349¼

O. J. SYME, Macedon. (Friesian.)

Completed during the quarter, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Jennie de Kol	Not yet allotted	20.4.19	273	20	10,196	3·92	400·25	250	456¼
Pearl of Friesland Park ..	"	15.5.19	273	13	11,041	3·92	432·51	250	493

D. G. TOMKINS, "Muntham," Coleraine. (Jersey.)

Completed during the quarter, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Cloth of Gold of Clover Flat	4457	21.4.19	273	25	8,697	4·82	419·55	250	478¼

H. WEBB, Narrewarren. (Ayrshire.)

Completed during the quarter, 4. Certificated, 4.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Hazel of Holly Green ..	4768	18.4.19	273	13	6,249	4·48	279·75	200	318¾
Jessie of Holly Green ..	4769	7.5.19	273	17¼	6,303	4·38	276·02	200	314½
Rosette of Holly Green ..	4783	12.5.19	273	9¾	7,732	4·89	378·23	250	431¼
Primrose of Holly Green ..	4779	22.6.19	273	15½	6,596	4·03	266·00	200	303¼

W. WOODMASON, Malvern. (Jersey.)

Completed during the quarter, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Jenny Lind X. of Melrose ..	6302	13.4.19	273	24	8,612	5·48	471·60	250	537¾
Flower VI. of Melrose ..	3641	30.4.19	273	25	8,496	5·24	444·32	256	506¾

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

PLANTING.

The time has now arrived for the general planting of deciduous fruit trees. The soil should have previously been well ploughed and subsoiled, and, as far as possible, drained. To insure satisfactory results, it is essential that the orchard be subsoiled. Where expense is a consideration, drainage may be left for subsequent years, but once the orchard has been planted, it will be impossible to subsoil.

When planting out, the distance between the trees will be determined by the kinds to be planted. For ordinary deciduous fruiting trees it is the custom in this State to plant them 20 feet apart in the rows, the rows also being 20 feet apart. Results have proved this to be a satisfactory practice. Almond trees may be planted 15 or 16 feet apart each way, while walnuts, owing to their spreading habit, require a distance of 30 feet.

Deep planting is not advocated, the general practice being that the depth of planting in the nursery should be followed. If holes be dug, they should be shallow, the bottom being merely loosened to allow a comfortable friable bed for the tree roots. A good practice is to dig the whole strip along which the trees are to be planted, merely removing sufficient soil afterwards when planting. Another satisfactory custom is to plough furrows 20 feet apart, and to plant the trees in the furrows filling in the soil over the roots and trampling well down.

Before planting, the roots of the young trees should be well trimmed shaped to an even form, and cleanly cut. As the result of their removal from the nursery beds, the roots are generally more or less damaged, and numbers of the fibrous roots, becoming dry, shrivel and die. These all require a clean trimming. Then it is often desirable to remove some of the roots so as to balance the root system. The trimming of the roots gives the young tree a clean root system, and it is enabled to establish itself with young, vigorous roots.

After planting, the top should be well cut back, so as to leave three or four arms, with three or four buds on each. Where it is not possible to have this number of arms or limbs it is frequently advisable to cut back to one stem, allowing the buds to break out strongly and frame the tree after planting. In some countries, the custom of not cutting back the trees the first year is favoured. Local experience has not resulted in favour of this practice, as it is found to be inadvisable to unduly strain the young tree by leaving a heavy top to be supported by the weak-growing root system

A number of good commercial fruits have been found to be either wholly or partially self-sterile, requiring other varieties near them to enable them to set their fruit. For this purpose it is necessary that the bloom periods should be somewhat coincident.

SPRAYING.

Spraying should now be done to combat scale insects, woolly aphis, and bryobia mite. Any oily emulsion, or the lime-sulphur spray, may be used, and for woolly aphis it will be necessary to apply the spray with considerable pressure, so that the liquid may penetrate the glossy covering of the aphis.

GENERAL WORK.

All ploughing should now be completed; if not, it should be finished before spraying and pruning operations are proceeded with.

Any autumn manuring or liming should also be now carried out. This, too, should be finished before spraying or pruning. Before spraying with oils or with lime sulphur wash, all rough bark on apple and pear trees should be scraped off. This will mean the certain destruction of any codlin moth larvæ hiding underneath.

The Vegetable Garden.

If not previously done, asparagus beds should be well cleaned out, and a top dressing of manure given. To insure good drainage, the soil from the paths, or between the beds, may be thrown up on the beds, so as to deepen the surface drainage, and to consequently warm the beds. This will mean earlier growths. A heavy dressing of manure should be given, and the beds well and roughly dug over.

Plant out seeds of tomatoes and the pumpkin family in the frames; and sow in the open seeds of peas, lettuce, spinach, broad beans, radish, onions, carrot and leek. Asparagus crowns, rhubarb roots, tubers of Jerusalem artichokes, shallots and onions may now be planted out. Celery should still be earthed up, taking care not to have the beds too wet.

The Flower Garden.

General cleaning up and digging will be the work for this month in flower section and shrubbery. Where the soil is heavy or sour, or where sorrel is plentiful, the garden should be given a heavy dressing of fresh lime, a fair dusting being applied all over the surface. Lime should not be used in conjunction with leaves, garden *débris,* leaf-mould, stable manure, or any other organic matter used for humus. These should be first disposed of by digging well into the soil; then shortly afterwards a top dressing of lime may be given. Should no humic material be used, the lime may be dug in with the autumn digging.

In cleaning up gardens, all light litter and foliage should be either dug in, or, better still, it should be placed in an out-of-the-way corner to form a compost heap. Leaf-mould, well rotted, is especially useful in any garden, particularly where such plants as Azaleas, Rhododendrons, Liliums, &c., are grown, or for pot plant work it is exceedingly valuable. In forming the compost heap, no medium whatever should be added to help the rotting down of the leaves unless it be a little sand. Any chemical added will render the mould unsuitable for its special objects.

Any hardy annuals may be planted out, such as stocks, pansies, wall-flowers, &c., and cuttings of roses and hardwood shrubs may also be planted. In planting out cuttings it is very important that all the eyes should be removed from the part of the cutting which is to be below the ground. If this be not done, there will always be the subsequent danger of the plant suckering.

Roses and any summer and autumn flowering shrubs that have finished flowering may be pruned. If the spring flowering shrubs have not previously been pruned, they should be allowed to remain until after the next flowering season. This especially applies to such plants as Spireas, Philadelphus (Mock Orange), Deutzia, Prunus Mume, and other early flowering shrubs. To prune these now would mean the certain loss of a great proportion of their flowers.

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ELECTRO-CULTURE.

A GENERAL REVIEW OF THE SUBJECT.

By F. J. Rae, B.Sc., B.Ag. Sc., School of Primary Agriculture, Burnley, Victoria.

At the present moment there is a serious world shortage of food-stuffs and of raw materials. Increase in production, whether by increasing the area under cultivation or by the use of improved methods, is a vital necessity. In the present state of the world's unrest it is highly probable that the shortage will be severely felt for a long time to come, and the maxim that the man who can make two blades of grass grow where one grew before is entitled to rank as a public benefactor, is probably more true to-day than ever before.

While it may not be immediately possible to double the yields from our present areas, still it behoves us to be ever on the alert to take advantage of any development that may tend in the direction of increased production, and it is fitting that serious consideration should be given to any practical proposal for increasing the fertility of the soil. It is with the object of directing attention to a somewhat obscure and little heard of branch of agriculture that the present account of the subject of Electro-culture is written.

Many people have a deep-rooted distrust of what they call "new-fangled ideas," and this, combined with the general lack of knowledge of electricity, has made them slow to examine the results or to take advantage of the benefits claimed for Electro-culture. Thus the matter has been left, and still is in the hands of a few enthusiasts, some of whom have conducted costly experiments for many years with varying success, but always with the indication that greatly increased yields were obtainable if only the electrical stimulus could be applied in the right way.

HISTORICAL.

The idea of stimulating the growth of plants by the use of electricity is not a new one. The earliest known experiments were carried out at Edinburgh by Dr. Mainbray, a Scottish physician, over 160 years ago (1746). Even before this time there seems to have been a popular belief that electrical discharges (thunderstorms) were in some way concerned in stimulating the growth of plants. The general failure of the hop crop in 1787 was attributed, rightly or wrongly, to the almost entire absence of lightning for the season.

Mainbray experimented with young myrtle trees, and demonstrated that electricity accelerated growth. During the next fifty years his experiments were repeated and his observations confirmed by numerous experimenters. The scope of the experiments was gradually enlarged; tests were made with a great variety of plants, and some attempt was made as early as 1747 (the year after Mainbray's experiments) to explain the reasons for the various phenomena observed. The general results recorded were that plants when stimulated by electricity grew more vigorously, had larger leaves, and that they flowered and matured earlier.

In 1783 Berthelon was the first to attempt to apply the use of electricity to the production of crops, and he even went so far as to recommend its use as a remedy for fungus diseases and insect pests. It may be interesting to note at this stage that experiments conducted over 100 years after Berthelon's time, have also demonstrated that crops under the influence of electrical discharge suffer less from the attacks of fungus diseases than others. In this and in other respects Berthelon seems to have been ahead of his time. He also investigated the effect of electrified water on plants, and he electrified seeds by wrapping them individually in tinfoil. He seems to have been the first to consider some of the problems of electro-culture that are engaging most attention at the present time, and which will be discussed later. A quaint old print shows him mounted on an insulated truck being drawn around the garden while he applied electrified water to his plants.

For a period of 100 years after Berthelon's time nothing of outstanding importance seems to have been accomplished, till in 1885 Lemstrom commenced a series of experiments, and became the founder of much of the more modern experimental work in effects of electricity on plant growth. He states that his attention was first directed to the subject by observing the prolific growth of plants during his explorations in high (polar) latitudes. He suspected that this growth was due to the electrical discharges associated with auroral displays, and claimed that the very structure of these plants—needle leaves of the pine and the awns of cereals—fitted them for collecting the current that is known to be passing from the atmosphere to the earth. On his return he began experimenting. His plan was to stretch above the ground a network of wires well insulated from the earth. These wires, which were provided with points making them look somewhat like barbed wire, were highly charged with electricity which escaped from the points across the intervening airspace, through the plants to the soil. This method, though modified by other experimenters (amongst them Sir Oliver Lodge) is still in use.

More recent developments include the electro-chemical treatment of seeds, but this aspect of the subject will be dealt with later on.

MODES OF APPLICATION.

The results that have been collected by all of these experiments have established beyond all doubt that beneficial effects are to be obtained by the application of electrical stimulus to plants or seeds. The big problem is, "*How can this stimulus be most economically and effectively applied?*" The experiments so far conducted fall into classes that differ mainly in the mode of application of the electric current—

(1) Illumination by electric light.
(2) Conduction of atmospheric electricity from elevated conductors to the soil.
(3) Burying plates of copper and zinc in the soil and using the soil as an electrolyte.
(4) Passing a current through the soil from external sources.
(5) Silent discharge from antennæ or overhead network.
(6) Electro-chemical treatment of seeds.

These classes simply represent the different methods used by various experimenters in their attempts to apply electrical stimulus to plants or seeds. A brief account of each of these methods may prove of interest. It is, of course, impossible in a brief review of this description to enter into a discussion of the precise details of the experiments. The results achieved are our chief concern. The use of technical language has as far as possible been avoided.

(1) Illumination by Electric Light.

Experiments in this direction were commenced soon after the discovery of the electric arc light, and many curious results were observed. It was soon discovered that the naked arc light caused damage to plants, but when screened by a transparent glass screen the harmful effects were removed, and very beneficial results obtained.

The effect of the glass screen or a glass globe was to cut out the harmful rays. Numerous other forms of electric light, such as the incandescent electric light, &c., have been tried, and, generally speaking, the results have been good, though all plants are not similarly affected. The use of lights on a big scale is not practicable, so that its application has been restricted to market garden and greenhouse plants. Rawson—a Boston market gardener—has used electric light in raising lettuces for many years with great success. Lights of various colours have also been tried, and the development of produce can be hastened or retarded by their use.

The results obtained at the West Virginia Experimental Station may be summed up as follows (Bulletin 37):—

(i) Electric light is beneficial to some plants for foliage—lettuce.
(ii) Leaves of deeper green.
(iii) Flowers bloomed earlier and longer and were of deeper colour.
(iv) Some plants tend to run to seed—spinach.
(v) Does not benefit all plants equally.

It is claimed that electric light is to be regarded as a valuable asset in the forcing of market garden and greenhouse produce, and in producing fruits and flowers out of season. Mr. Lunt, of Spreydon, New Zealand, has used electric light in his glasshouse for raising tomatoes.

Light used from 9 p.m. to 5 a.m. gave beneficial effect on quantity, quality, and recovery from frost-bite. Apart from the stimulating effect of the light itself there is the factor of warmth associated with the light. Attempts have therefore been made to use electric lights with the object of preventing damage by frost. This is only possible where current is readily available at a low rate, as is the case where hydro-electric schemes have been carried out. The experience of Mr. Farr, orchardist at Fendalton, New Zealand, in this respect is interesting. In his pear and apple orchard he placed a 250-watt radiator in each tree with the object of preventing damage by frost. Frost-bite was prevented, and though there was no increased yield of pears the apples produced an abnormally heavy crop, and were ready for market a fortnight earlier than those in adjacent orchards.—*Journal of Agriculture,* New Zealand, vol. xv., p. 185.

It was while engaged in investigating the effect of electric light on plants that Dr. C. W. Siemans (England) originated the term "Electro-Horticulture," which is still generally used for work of this description, though the wider term "Electro-culture" is now used to embrace the application of electricity in any way to the production of any sort of plant.

Writers in our daily papers occasionally draw attention to the abnormal behaviour of some plant or tree putting out leaves, &c., at some unusual season when situated within the sphere of influence of some street light. It is possible that such behaviour is in a measure due to the influence of the light.

(2) Conduction of Atmospheric Electricity from Elevated Conductors to the Soil.

Attempts to make use of atmospheric electricity by collecting it by means of elevated conductors for discharge either directly into the soil or from an overhead system of wires, seem to have been confined mainly to France. The possibilities of utilizing atmospheric electricity, and even the part that it undoubtedly plays in influencing plant growth, have never been adequately investigated, and little is known about the subject. That such an influence does exist was proved by Grandeau (1879) when he demonstrated that plants protected from atmospheric electricity had their development much retarded. A big field for research is left practically untouched. However, some experiments have been carried out. The general method employed is to attach a conductor to a tall tower, and to connect this with buried plates or networks of wire. Few accounts of these experiments are available, so that it is only possible to refer to them in passing. The cost of the installation would be considerable, and large increases would be necessary to justify the expense. The following results are recorded by F. Paulin, a French experimenter:—

(i) Increased per cent. germination.
(ii) Potatoes, 50 per cent. increase.
(iii) Cauliflowers, matured one month early.
(iv) Beans and peas, 200 per cent. increase.

Experimental Station Record, vol. xv., p. 36[illegible]

A cheaper method said to be very effective is to plant numerous metal stakes several feet long all over the field to act instead of one tall conductor. In the absence of details it is impossible to comment on the results beyond stating that further experimental work would be amply justified, though G. F. Lees, writing in the *World's Work* (England), February, 1919, does not regard the system as practicable.

(3) Burying Plates of Copper and Zinc in the Soil, and Using the Soil as an Electrolyte.

This method, if it has nothing else, has at least cheapness and simplicity to recommend it. The writer has been able to discover very few references to it, but the most important of these are quoted below.

In 1844 an American named Ross read a paper before the New York Farmers' Club describing his experiments. He buried a copper plate 5 feet long by 14 inches wide at one end of a plot and a similar plate of zinc at the other end 200 yards away. These plates were connected by an insulated overhead wire. The plot was thus made to act as a galvanic cell—the current flowing round the circuit when the wire was connected. He claimed an increased yield of 50 per cent. of potatoes. Numerous other experimenters got contradictory results, and the matter does not appear to have received any extended attention. However, recent experiments show that increased yields of vegetables are obtainable by this means. (J. W. Crow—Annual Report Ontario Agricultural College and Experimental Farm 34, 1908, page 150).

So little expense or time or trouble is involved that gardeners should be tempted to make a trial for themselves in a small, well-manured plot with smaller plates. Galvanized iron could be used instead of zinc.

(4) Passing a Current through the Soil from External Sources.

This was the method adopted by Mainbray in his original experiments, and his example was followed by many of the earlier experimenters. The process seems to have been rather overshadowed by the development of other systems which apparently gave better results. In 1894 C. Flammarion reported having stimulated the growth of beans by placing them between electrodes connected with a Leclanche cell (ordinarily used for electric bells, &c.).—Experimental Station Record xiv., page 548.

No very striking success seems to have been obtained by this method, but more recent results would indicate that it still has possibilities. Good results have been obtained by the use of carbon electrodes instead of ones of metal, and also by dusting the seed with fine metallic filings before sowing. There is some resemblance here to the method adopted by Berthelon, in 1783, when he wrapped seeds in tinfoil and electrified them before planting. Generally speaking, the results obtained by passing currents through the soil have not been promising. This phase of the problem does not seem to have been as thoroughly investigated as others, but the latest developments would indicate the possibility of valuable results being obtained from the experimental work in hand.

(5) Silent Discharge from Antennae or Overhead Network of Wire.

This method of applying electrical stimulus to growing plants was greatly developed by Lemstrom (1885) though attempts had been made to use it long before his time. The system is of great importance, because it is the one that has claimed most attention ever since.

Lemstrom's work gave rise to a great number of experiments, some of which are still in progress. Subsequent experimenters modified his methods greatly, but the general principles remain the same. It is known that the atmosphere is charged with variable quantities of electricity, and that the charge is continually leaking away to the ground through the plants. The charge is very variable, being small in normal weather, but increasing with thundery conditions, when the leakage becomes correspondingly greater. In the system under consideration there is spread over the plants a network of fine wire so highly charged with electricity that it is discharged into the air, and increases the current passing from the air to the plant to about ten thousand times its normal value.

The current used may be derived from various sources, *e.g*

(*a*) Atmospheric electricity.
(*b*) Dynamos driven by small engines.
(*c*) Town supplies.

The use of atmospheric electricity in this respect has been largely confined to continental countries, and experiments are still in progress. Reports of the experiments of Berthelot (distinct from Berthelon) at Heudon and of Basty at Tours (France) state that beneficial effects were obtained in all cases (E.S.R. xx., page 1124). Experiments have also been carried out in Italy, but apart from some experiments by Foster (England) as early as 1844, the use of atmospheric electricity has been neglected in English-speaking countries. Foster conducted the current derived from the atmosphere to wires spread over a crop of barley, and claimed that he had obtained a greatly increased yield.

The greatest development, however, has taken place in the use of dynamos and of town supplies as the source of the current. The general method is to pass the current through the primary of a coil, and by this means to produce a high tension current in the secondary, but the current is alternating in character—going first in one direction and then in the other. By means of specially designed valves the current is allowed to pass in one direction only, and the alterations are eliminated. Thus a potential of about 100,000 volts is kept up in the overhead wires, causing them to glow in the dark, and to discharge with a slight hissing noise. Great care has to be taken with the insulation of the wires from the ground.

The equipment is costly, and the wires are a hindrance to farm operations. Mr. Britton, experimenting at Chester, estimates the cost of an installation for 24 acres at £300, with an annual upkeep of £63, while a system for 300 acres would cost £1,500. This estimate was made in 1917, and the cost would be a great deal higher at the present time. (*Engineer*, vol. 124, page 74).

From this it will be seen that experimental work is greatly hampered by the fact that a cheap and effective type of apparatus is not yet available.

In spite of the heavy costs a great number of experiments are still in progress, and the results are sufficiently striking to justify a great deal more investigation. It has only recently been discovered that the effect of the discharge is not confined to the area under the wires. It extends 30-40 yards on either side in calm weather, but if the weather is windy the influence extends several hundred yards down wind. The control areas cannot therefore be placed within hundreds of yards of the experimental plot. In some of the earlier work the control areas were affected by the discharge, and much contradictory evidence was obtained. The Board of Agriculture (England) has investigated the matter, and the results obtained by reliable experimenters can scarcely be questioned. Some of the results are quoted below:—

S. E. Britton, Chester, England (1918).

Increase in yield of potatoes, 150 per cent.

Electrical World, vol. 73, p. 783.

Miss Dudgeon, Lincluden, Dumfries (1916).

Increased weight of grain, 49 per cent.

Increased weight of straw, 88 per cent.

Kind of crop not stated.

Engineer, vol. 123, p. 450.

Potatoes—

Variety.	Increase per acre.
Ringleader	2 tons 4 cwt.
Windsor Castle	1 ton 17 cwt.
Golden Wonder	13 cwt.
Great Scott	1 ton 10 cwt.

Cost of application, £4 7s. 6d.; area 8 acres. Tubers ready a week earlier.

Journal Board of Agriculture (Eng), vol. 23, p. 671.

P. Van Biervliet, Pringsheim, Germany (1904).

Increase for strawberries	125 per cent.
Increase for barley	32 ,,
Increase for beet	119 ,,
Increase for beans	30 ,,

Experimental Station Record xvi., p. 557.

Newman, Salford Priors, Evesham (1906-1911).

Area, 19½ acres.

Increase for wheat	20 per cent.
Increase for barley	5 ,,
Increase for mangolds	25 ,,

Engineer, vol. 124, p. 74 (1917).

The great majority of the experiments have yielded highly encouraging results, but a number of cases have occurred in which the results have been disappointing, and in which the increased yield was not sufficient to justify the expense of application. It is generally agreed that, before the system can be recommended, more knowledge is necessary on many points. The most suitable strength of discharge is not yet known, and the manurial conditions and the effects on different types of soil are not understood. Experiments are still in progress with the object of throwing more light on to these points.

The assumption underlying the work is that the passage of a small electric current through the plant is beneficial to it, and tends to increase the yield and very often to lessen the time in which that yield is obtainable. It is thought that there is an optimal value for each special plant concerned, and that this value is variable for different plants, and even for the same plant at different stages of its development. Currents in excess of these optimum values will cause harm. Electrified plants transpire more water, and are therefore liable to suffer if treatment is continued in dry weather. The disease-resisting power of a plant is largely a function of its vitality—the more virile plants escaping disease. Numerous experimenters have observed that electrified plants were freer from fungus diseases than others in the vicinity. Another advantage claimed is that the succeeding crop is also greater. In addition, there are important differences in the quality of the crop — cereals showing a higher percentage of nitrogen compounds, and beets an increase in sugar content. The experiments have until recently aroused little more than local interest. About 1910, Professor Breslauer (a German), visited Mr. Newman's installation at Evesham, and was struck by the significance of the experiments. Having secured the agency for the apparatus, he very soon sent in more orders for sets than there had been inquiries in England. Six sets of the Lodge-Newman apparatus were delivered and installed in various parts of Germany. Reports say that good results followed. Though excellent results have been obtained from this method, the lack of precise and definite knowledge on many points leads to the conclusion that there is not yet a sufficiently strong case to warrant the general application of this method to crop production. It is already known that dry conditions are quite unsuitable for its successful working, and this in itself would be a powerful argument against its adoption except in special cases in Australia.

(6) Electro-Chemical Treatment of Seeds.

Recent developments in this phase of electro-culture indicate that it is in this direction that we may expect the most practical developments to take place. It is rather difficult to trace the history of the subject, and it is probable that the work of many of the pioneers did not receive much publicity. Some credit is due to the old experimenter, Berthelon, who electrified seeds by wrapping them in tinfoil. His treatment was not electro-chemical; still he arrived at the same result—electrified seeds—by a different process.

One of the foremost workers along this line of development is M
H. E. Fry (Dorset), whose work has recently attracted a great deal

attention. The method adopted is to pass a current through a solution in which the seeds are immersed. The solution is then drained off, and the seeds dried and sown within a month. Details of current, solution, &c., are not disclosed. Mr. Fry started by sowing seeds in pots, and later in a garden plot. He had some difficulty in persuading a neighbouring farmer to plant some treated seed. The results were so striking that they attracted the attention of other farmers, and in 1918 over 2,000 acres embracing all types of soil were sown with electrified seeds by 500 farmers. The increase in yield ranged from 6 bushels up to 16 bushels to the acre. The British Board of Agriculture investigated the matter, and reaped, threshed, and weighed samples of the crops, and found an average increase of 10.5 bushels per acre to the credit of the electrified seed. The average gain per acre of eleven farmers, after deducting the cost of treatment, was £4 13s. These figures are so extraordinary as to cause doubts as to their correctness, but they can be accepted without the slightest hesitation, coming, as they do, from the British Board of Agriculture, and from experts, representing various agricultural societies, who supervised the work.

Not only was the yield vastly increased, but the quality of the grain was superior. The bushel weighed from 1 to 4 lbs. heavier, was of better milling quality, and produced less offal and more flour.

An even more important effect is to be found in the increase of resistance to rust and other fungus diseases. This was also observable with the use of the overhead discharge already noted. There was also an increase in the quantity and quality of the straw, which tillered out better, and was invariably longer, stouter, and stronger, and less liable to be blown down by storms. It seems to be a very extraordinary thing that the mere passing of an electric current through a solution containing the seeds should so profoundly affect their vital functions as to stimulate germination, growth, resistance to disease, earliness of maturity, and even to modify the quality of the grain and straw produced.

A great deal of experimental work is still necessary, and the proper treatment for each kind of seed and for each type of soil can only be determined by long series of experiments through a period of years. Even with the present knowledge the process can be regarded as established in England. The officer in charge of American interests in Great Britain after a tour of inspection advised his Government to have immediate trials made in every State of the Union.

The cost of the apparatus required is not great, and its handling is very simple. The system devised by Mr. Fry is known as the Wolfryn process, and is protected by patent rights.

Experiments were carried out by a Mr. Butterworth in South Australia years before Fry started to work. He obtained striking results, and planted out a considerable area with treated wheat. Mr. Butterworth died before the crop was harvested, and the results are not known. Mr. Chas. Barclay, Corney Point, South Australia, is also said to have increased his yield 40 per cent. on 60 acres, but no further results are available. Experiments were also carried out at the Hawkesbury Agricultural College by passing a current through the ordinary

copper sulphate pickling solution. Though Mr. Fry's work has attracted so much attention as opening up a new phase of the subject, it must not be forgotten that he was preceded by many years by several Australian experimenters.

The attention of those interested in the subject is directed to a full-page article in the *Sydney Mail*, 25th February, 1920. It gives an account of results obtained by a correspondent in experiments with various vegetables. It also mentions the case of a lady experimenter in Queensland who used a current generated by running the lighting gear on her car. A further account of the subject appears in the February number of the *Journal of the Institute of Science and Industry*. Numerous inquiries have been made for information as to the solution to be used and its strength, the time of application of the current and its strength, but an exhaustive search through the literature bearing on the subject does not disclose these details so that those desirous of experimenting must either wait till details are available or start off as original experimenters. Experiments are at present being conducted at the Burnley School of Horticulture and Primary Agriculture.

A book—*A Manual of Electro-Chemical Treatment of Seeds*, by Dr. C. L. Mercier—is at present in course of publication, and it is expected that when it is available* it will disclose the details of the process.

EXPLANATION OF RESULTS.

Some attempt was made in 1747 to explain the results obtained by Dr. Mainbray in the preceding year. While many of the observations made since then are undoubtedly correct, it cannot be said that any satisfactory explanation has yet been put forward. The electric stimulus causes increased transpiration from plants and fruits, hence early observers ascribed the results to the accelerated motion of the cell sap through the plants. Others consider that electricity renders certain soil constituents more soluble, but this neglects the fact that seeds can be stimulated apart from the soil.

Bains, in a recent work, concludes that the use of low electro-motive forces in agriculture and floriculture is in accord with natural laws, as these currents are always flowing, and slight increases applied in the right way at the right time may result in some benefit.

Other recent observers ascribe the result to increased aeration of the soil, the production of minute quantities of nitric acid and the stimulation of bacterial activity. None of these factors would be operative in the case of electro-chemically treated seeds.

It must be remembered that we are applying a very little understood force to an organism the interior and essential processes of which are still largely unknown to us. The outstanding fact seems to be that electricity, provided the current is not too great, no matter what its source may be, and no matter what mode of application is adopted, exercises a stimulating effect on germination, growth, and maturing of plants, but the reasons for it are mainly shrouded in mystery.

* This book is now available.

SOME PHASES OF POOLING.*

By R. Crowe, Exports Superintendent.

During the last few years pooling of primary products has been adopted more or less throughout the whole civilized world. Circumstances arising out of the war justified this method of dealing for the time being. It might have been impossible to have arranged for the sale of our surplus wool, grain, dairy produce, meat, &c., without bringing into existence organizations with which every one is now familiar, some of whch appear to have taken root.

The time is now ripe to consider the subject generally and in detail. If it has been found advantageous in any respect, the system should be continued, and if proved harmful or even unnecessary, then the sooner it is dropped the better. Of course, it may be desirable to continue pooling for a time, or perhaps altogether, with one commodity, and less desirable, or even pernicious, with other classes of goods.

There are many phases of pooling, and certain forms of it would, I consider, benefit primary producers if put into operation. For instance, in Canada, the wheat is pooled when it reaches the silos, and store warants given the producer according to the grade of wheat delivered. It is likely that in time pooling of this kind will become more general, the world over. It would be an advantage, too, if fruit-growers pooled their fruit for export.

I have no doubt of the necessity for establishing export packing depôts in every large fruit-growing centre, where, for example, all the Jonathans could be graded according to quality and size, packed and sent away under the name of the district or registered brand. Likewise with other varieties. If this were done, higher prices would be realized in the export markets, and thus each and every fruit-grower concerned would benefit. To give some idea of what is meant, reference may be made to the first shipment this past season. The s.s. *Borda* took a total of 50,000 cases, under *260 different brands.* With a co-operative pooling system such as has been adopted by the Californian Fruit Growers' Exchange and the Western Pacific Exchange, the major portion of this shipment could have been shipped under about ten brands, and under normal conditions higher prices would be realized.

However, it is not these aspects of pooling that I especially desire to bring under your notice just now. You are all well aware of the persistent efforts recently made in all the States of the Commonwealth to maintain pooling in some form or another in connexion with the export and sale of the surplus dairy produce of Australia.

Disadvantages of Pooling Butter.

At the Conference of the Butter and Cheese Factory Managers' Association in 1918, I pointed out that by pooling the surplus butter of the Commonwealth for export to the Imperial Government and fixing the local price at an almost uniform level the year round, winter dairying was discouraged.

* Paper read at the Convention of the Chamber of Agriculture at Port Fairy, 24th June, 1920.

To produce butter in the winter time involved the cultivation of land, purchase of seed, harvesting of fodder crops, and labour in feeding cows. Furthermore, cows artificially fed in the winter did not give as good a yield as when producing in the spring and summer. The work of dairying in cold, wet weather, when the days were short, was not attractive, and it cost anything from 50 to 100 per cent. more to produce each pound of butter at that time of the year as it did in the spring months. Consequently, dairymen altered their former policy of leaving some of the cows to come into milk in the winter, and arranged matters so as to bring as many of their cows as possible into full profit in the early spring, and thus get the best return during the most favorable season of the year. They also refrained from the cultivation of fodder crops for winter dairying.

At the 1919 Conference, this phase of the industry was further enlarged upon, and I stated that owing to the control and regulation of prices of dairy products as compared with other primary industries, land that was previously used for dairying had been largely diverted to the production of meat, wool, and other more profitable uses.

It appears that this transformation is not confined to Victoria, as the following figures will show:—

In 1911-12 there was a surplus of 45,000 tons of butter exported from the Commonwealth after fully supplying local requirements;

In 1917-18 the surplus exported was 31,500 tons;

In 1918-19 the surplus exported was 16,400 tons;

and for this season, 1919-20, it will be little more than 8,850 tons.

The less favorable seasons are to some extent accountable for the falling off, and to a very minor extent the diversion of milk into condensed, concentrated, and dried form is responsible. The chief cause is due to the utilization of land formerly used for dairying for more profitable purposes.

As compared with pre-war times, the price of butter is high, and generally considered satisfactory. It must be remembered that the prices of everything else are also high, and if a farmer can make a more profitable use of his land than by dairying, it is folly to devise means of stopping him from doing so.

It is becoming more universally recognised that no one section should be singled out for control and regulation to their disadvantage in order to benefit the rest of the community, and if price-fixing is to become the order of the day, it should be made to apply all round. Such a policy, however, would involve the cutting off of essential supplies which perhaps could not be made to yield their cost of production, and imported commodities would be particularly affected. It would be futile to approach the English, American, or Japanese manufacturer for commodities at a fixed percentage above pre-war rates, if such manufacturers could dispose of their whole production elsewhere at the present world's market prices.

POOLING AS IT AFFECTS VICTORIA.

It is not generally recognised that Victoria enjoys a more natural season for production than any of the other States of the Commonwealth. Usually, the spring arrives in August-September, with a

growing surplus above local requirements. Some of this early surplus has to be sent to the northern States regularly every year to meet their shortage, and export overseas immediately follows. The peak of the season occurs in the month of November, after which production gradually declines, until the export season ends about March.

With New South Wales the height of the season is experienced a month or six weeks later; whilst in Queensland, the new season's surplus butter is available still later, and the height of the season there is not reached until after the New Year—and sometimes as late as February and even March.

This means that the Victorian exports more naturally, or seasonably, meet the time of greatest scarcity in the United Kingdom when prices are highest. New South Wales does not enjoy such a high range of values owing to meeting a falling market; Queensland fares still worse in this respect. The exports from that State frequently overlap the heavy spring supply of dairying countries in the Northern Hemisphere when prices are at their lowest level. It has been found in normal years more profitable to store the surplus in Queensland at the end of the season till the beginning of the next export season.

Taking the exports to the United Kingdom from the three States named for the seasons 1911-12, 1912-13, and 1913-14, and applying the ruling price periodically for deliveries on the United Kingdom market from each State, it will be found that if the butter had been pooled, as has been done for the last few years, Victorian producers would have lost £77,000 for the three seasons mentioned, and the northern States (chiefly, Queensland) would have been the gainers to the extent of £77,000.

The earlier season of production in Victoria for the three seasons prior to the war gave producers of this State an advantage of more than £25,000 per annum over the northern States. It is therefore not a matter for surprise that the northern States have fallen in with the proposal for a continuance of the pooling system, but it would be astonishing indeed if the Victorian dairymen agreed to the suggestion.

The trade in tinned butter for the East is catered for chiefly by Victoria, notwithstanding the fact that the northern States of New South Wales and Queensland are more favourably situated geographically, and have the further advantage of a better steamer service and marketing facilities through the Burns-Philp organization, whose steamers do not lift produce at Melbourne.

The tinned butter trade was developed by the enterprise of Victorian exporters, and continues to be held by them.

About 84 per cent. of the butter exported in tins is shipped from Victoria, and for a considerable time past 2d. per lb. more has been received for such butter above the cost of tins and preparation than for other export butter. Producers have had that advantage intercepted, as the increased price had to be paid into the Pool, and it is not yet very clear whether Victorian producers will receive the large percentage of the distribution which they are entitled to enjoy.

Some time ago a proposal was made to standardize the butter of the Commonwealth by providing for one quality similar to that in Denmark, and the nationalization of the product by the adoption of a national brand. This meant one standard and one brand for Australian butter.

Now, if standardization were intended to apply to composition, it might be pointed out that it is already provided for in the Commerce Regulations which have been in operation for the last fourteen years. Such being the case, it must have been meant to apply to quality only.

The following table gives particulars of the quality of butter exported from Victoria for twelve years, and it enables any one to see what such a proposal would mean. It was not mentioned where the minimum line was to be drawn. If at 92 points, then 42 per cent. of butter previously exported would have been condemned as not being eligible for the export trade. Should it be at 90 points, the percentage would be 20 per cent.; and, if drawn at 88 points, 12 per cent.:—

Grade.	No. Boxes.	Percentage.	
Superfine, 99	4,226	0·07	
" 98	162,729	2·66	
" 97	226,993	3·71	
" 96	315,530	5·16	
" 95	609,596	9·96	
	1,319,074		21.56%
1st Grade, 94	693,810	11·33	
" 93	730,802	11·93	
" 92	822,649	13·43	
" 91	675,723	11·04	
" 90	632,135	10·32	
	3,555,119		58.05%
2nd Grade, 89	242,177	3·95	
" 88	292,931	4·79	
" 87	183,668	2·99	
" 86	123,787	2·02	
" 85	105,112	1·72	
" 84	89,614	1·46	
" 83	69,172	1·14	
	1,106,461		18.07%
3rd Grade, 82	48,583	0·79	
" 81	27,148	0·44	
" 80	20,303	0·33	
" 79	10,665	0·17	
" 78	7,760	0·13	
" 77	7,255	0·13	
" 76	6,587	0·10	
" 75	2,431	0·04	
	130,732		2.13%
Pastry	12,054	Average Grade, 91·61	0.19%
	6,123,440		100%

Dairymen and butter factory managers do not make bad butter from preference. It often happens through circumstances that cannot be

controlled. To make a hard-and-fast rule, and to adhere to it, would be disastrous in many ways. Dairymen beginning on a small scale, and all those living long distances from factories, or where the roads are bad, would be severely handicapped. Most of them would have no chance of making a beginning, and developing their operations to dimensions which would warrant their taking greater care, and making more frequent deliveries of their cream to butter factories. Even in established dairying centres less butter would be produced than has been the case.

The same conditions do not exist all over a small State like Victoria, and they differ even more widely in the stretch from Cairns down to Hobart, and across to Adelaide.

What is wanted is encouragement and education.

If a uniform standard for quality were fixed at any point, it would destroy any inducement to manufacture a very superior article. This statement is not founded on theory; such a result has actually been encountered in connexion with the price-fixing for the local trade for the last few years.

Many of the butter factory managers openly state that they will not go to the expense of pasteurization so long as they get no more for the superior article than for butter which just complies with the standard for the various prices fixed. Why, they ask, should they produce a butter for the local market worth 94 or 95 points if no more can be procured for it than for 92-point butter? And similar questions regarding the lower grades may also be asked.

From experience gained during and since the war, standardization stands for mediocrity—as far as the local market is concerned, all incentive to excel has been largely destroyed.

With regard to the recent proposal for a national brand, it may be mentioned that every package of butter which has left Australia during the last fourteen seasons was branded, as required by the Commerce Regulations, with the word "AUSTRALIA." This brand has acquired a good-will during the period mentioned. In addition, the war secured to Australia recognition and a reputation of inestimable value throughout the whole civilized world. All good butter is further marked "COMMONWEALTH OF AUSTRALIA - APPROVED FOR EXPORT." A national brand with an acquired reputation is therefore already in existence, and it is difficult to understand what is meant at this stage by the adoption of a national brand—unless the intention is to make a change or have only one brand covering the butter from all manufacturers and States.

Such a step would destroy that healthy rivalry between producers, manufacturers, and States, which is the true life of any industry. Australia has been likened to Denmark, and it is suggested that one brand, and a number to indicate the manufacturer, would be sufficient. Such a proposal might be worthy of some consideration if it were intended to apply to a section only of the Western District of Victoria, with uniform conditions and the same area as Denmark; but if applied to the whole of Victoria, where conditions vary so much, it would be

found impracticable. It is, therefore, so much more out of the question when intended to apply to the whole of Australia.

The so-called standardization and nationalization are only phases of the pooling system. For some time past every inducement has been offered to dairymen in Australia to agree to a continuation of pooling in some form or another. Those who have not a reputation for producing a superior article, nor any ambition to do so, would readily agree to the scheme; whilst, on the other hand, people with individuality and independence will give the proposal a wide berth.

There is another matter to which I would like to refer that perhaps does not come under the heading of "Pooling." That is, the proposal to extend Commonwealth control over the production and manufacture of dairy produce. Officially, the State Department of Agriculture has been so far entirely in the dark, but for some time past it has been a matter of every-day knowledge that the Commonwealth proposes to undertake the control of production and manufacture of dairy products for export. These matters have hitherto been administered by the States, and as has recently been announced by the Minister for Agriculture, all the milk, two-thirds of the butter (average for a number of years past), and four-fifths of the cheese produced are consumed locally. Its production and manufacture are necessarily under State control through the Health, Pure Food, and Dairy Products Acts. The Dairy Produce Act recently passed in Victoria comes into operation on 1st July.

This past season, the proportion of butter produced in the Commonwealth which has been consumed locally amounted to seven-eighths; therefore the quantity available for export and coming under Commonwealth control now represents only one-eighth of the production.

Thus the intention is to duplicate services and the cost for same, the whole of which no doubt will have to be borne by dairymen and no one else. Whatever dairymen in other States do in regard to this proposal, it is expected that all sections of the industry in Victoria will see to it that unnecessary overlapping and duplication at their expense will not take place. It would be infinitely better if the details of inspection under the Commerce Act for export were again intrusted to the States. The States carried out these duties satisfactorily for twelve years. The Commonwealth could confine its efforts to general supervision and administration, and take up much-needed research work. If this were done, it would be better for the industry and the export trade.

The artificial conditions imposed on the dairying industry by the Commonwealth during the last few years are mainly responsible for the decline in production and quality. Obviously, the first step towards bringing about a revival should be the removal of these restrictions, and not an unwarranted duplication of legislative effort.

With the great falling-off in production in Europe through the decimation of dairy herds, a unique opportunity exists for the development of the dairying industry in the Commonwealth, and at no period was it more necessary to give it all the encouragement possible.

SOME FRENCH SWEET WINES.

THE SWEET WINES OF SOUTH-WESTERN FRANCE.

By F. de Castella, Government Viticulturist.

(Continued from page 175.)

The best known wines of south-western France are those of the Department of Gironde, which for quantity alone usually ranks third among the wine-growing departments of France—as regards quality it holds an even higher place, seeing that it yields, in addition to many more ordinary wines, the clarets of Medoc and St. Emilion and the white wines of Sauternes and Graves. The sweet wines of Sauternes (dealt with elsewhere) are considered, at least in France, to be the choicest of all fruity white wines.

The neighbouring departments also grow wine in respectable quantity—most of them, in fact, produce many times as much as the total wine yield of the Commonwealth. The great bulk is of the usual light dry type, mainly vin ordinaire with a certain proportion of choicer wines, but here and there localities are to be found, the name of which has since time immemorial been synonymous with something quite distinct. These special wines, though little known outside of France, are often most interesting, several of them are distinctly sweet, a few are intensely so, though they usually present a relatively low alcohol strength. Not the least interesting of these are the partially-fermented wines known as *Macadam* or *Bernache*, which constitute a type absolutely unknown in English-speaking countries, and which, incidentally, give a rude blow to many would-be critics of Australian wine, who are so prone to impugn the wholesomeness of our wines on the grounds of insufficient age. How often do we hear it stated by self-constituted mentors that the great fault of Australian wine is insufficient maturation—that young wine is rank poison, &c.? Age in wine does not necessarily constitute wholesomeness, nor is absence of age injurious. Age undoubtedly renders certain wines more palatable, but others again do not benefit by lengthy keeping. A high-grade claret is undrinkable under four or five years' storage in wood, and continues to improve for many years in bottle. Burgundies mature much more rapidly, whilst vin ordinaire, the every-day beverage of France, is drinkable at a few months old; it is at its best at twelve months, after which it shows little or no further improvement; and yet this is probably the most wholesome wine the world produces!

Macadam wines, as will be seen below, are consumed even before the completion of fermentation, and yet such extreme newness has no injurious effect on the health of the consumer; on the contrary, it is held in many quarters that the yeast cells still in suspension in the new wine have a positive medicinal value.

The present review of the sweet wines of France would be incomplete without a description of the leading types grown in South-western France, which are in the order of their importance:—

1. The sweet wines of Dordogne Department—Monbazillac, &c.
2. Those of Tarn Department—Gaillac, Albi, &c.
3. Those grown in the Department of Basses, Pyrénées, such as Jurançon (near Pau).

The Sweet Wines of Dordogne.

(For the following very interesting description of the wines of this region I am indebted to Mr. M. d'Arblay Burney, who for several years resided in this remarkable district, and is therefore well qualified to write at first hand concerning it.)

Monbazillac.

One of the most picturesque vine-growing districts in France is the Valley of the Dordogne. That portion where the river ceases to be the dividing lines between two adjoining Departments, and where the whole valley becomes included in the Department of Dordogne, constitutes the Arrondissment of Bergerac. Though this ancient town is familiar to modern English ears through the play of Cyrano de Bergerac, the whole Province of Guienne was for a very lengthy period an appanage of the Crown of England through inheritance. The antiquarian finds relics of English rule in evidence throughout the south-west of France, while the tourist is struck by the frequency of dogs called "Talbot." This is explained as being the name of the English General, Lord Shrewsbury, who was killed at the battle of Castillon in the Valley of the Dordogne. The defeat of the English army at this battle (1453) led to the complete loss of all French territory to the English.

As far back as 1352 the wine-producing district of Bergerac was described as consisting of the parishes surrouding Monbazillac on the left bank of the Dordogne, and those extending to Ste. Foy and Montravel on the right bank. For several centuries the name of Monbazillac has been given to a sweet white wine of world-wide fame produced in this neighbourhood. Holland has been for many years by far the largest foreign buyer of this wine, which in good years can be classed as one of the sweetest wines made in any part of the world, and, therefore, strictly a liqueur wine for use at dessert only. It is probable that this extreme sweetness was the means of restricting the popularity of this wine, as the demand for moderately sweet types has grown in leaps and bounds. The average yield of all wines, both red and white, from the Bergerac district averages about 6,000,000 gallons. Of this, at least two-thirds is red wine, mainly a big full-bodied claret much sought after by merchants for blending, owing to its great depth of colour and softness on the palate. These wines are, in fact, more akin to Burgundy in type, though not in flavour, as the Pinot grape is not grown, but only the best varieties of the Medoc. In point of quality, the white wines can be divided into four groups—

1. Monbazillac—sweet liqueur wine.
2. Côte Montravel—sweet table wine.
3. Macadam—sweet new wine.
4. Bergerac—dry table wine.

Monbazillac is produced in much the smallest quantity of the groups, owing chiefly to the great care needed in its preparation, as well as to the reduced yields consequent upon the method of production. This is worthy of detailed description, since the methods employed permit the production of a sweet wine of the highest class without the use of added spirit or any adulteration. As far back as 1774 the keeping of bees was expressly forbidden in districts producing sweet

wines, so that honey might not be used as an adulterant. Monbazillac is conspicuous among the white wines of the south-west of France for the complete absence of any taste of sulphur, which too frequently spoils, to many palates, the most famous Sauternes and Graves. The varieties of grape grown are white Sauvignon, Semillon, and Muscadelle. This latter variety has, so far, not been introduced to Australia, and must not be confused with Muscadet.

Muscadelle, or Muscade, is a thin-skinned white grape with a slight Muscat flavour of the same type as Chasselas Musqué and Muscat de Jesus. The flavour is totally different from that of Brown Muscat or Gordo, and has been likened to the perfume of orange flowers. Although we here find the same three varieties which are characteristic of the Sauternes vineyards, Sauvignon is planted in the proportion of about one-fifth to two-fifths of each of the other varieties. The soil is red clay in which is found flint and limestone.

Vintage takes place very late, by which time most advanced maturity has been attained. At least two or three pickings are the rule, so that only grapes which have reached absolute maturity are gathered. The necessity for going over the vineyard several times is caused by the vagaries of the climate. A hot summer followed by a dry vintage season invariably means fine-quality wines. In the Valley of the Dordogne very heavy dews are usual in the vintage season, such as we seldom see in Australian vineyards. These affect the appearances of the grapes and permit a fungus growth, called noble rot, upon the bunches, distintegrating the skin, allowing water of the berry to evaporate, and so concentrating the must. The sugar-strength is phenomenally high, and 20° Beaumé is said to be commonly attained. In fact, local writers often quote even a higher figure than this in favorable seasons, and they claim Monbazillac to be the sweetest natural wine in the world, a claim which finds justification, as the sweetness is certainly excessive, although it does not reach the almost treacly or semi-solid type of sweetness met with in some Australian wines. The difference is probably due to a different proportion of acids, in which Australian sweet wines are sometimes deficient, causing them to appear sweeter than they really are. The natural spirit-strength of Monbazillac is between 26 and 27 per cent. of proof spirit as a general rule, though higher figures have been found—the sugar-strength of the wine would thus be very high indeed in favorable years—between 4° and 8° Beaumé.

Shallow, wooden, basket-shaped boxes are used for picking, so that all falling berries drop into them and are not lost, as they frequently are in Australia. These boxes are emptied into light wooden tubs, which are carried on a man's neck and shoulders, by means of a straw and wooden frame, to the end of the row, where they are tipped into the larger tubs on the drays.

Grapes gathered at such a state of advanced maturity require no crushing, and are taken direct to the press. The juice is run into wooden vats of about 400 to 500 gallons' capacity; the last pressings are kept separate, and produce second-quality wines. It is allowed to sediment in the vats until the thick crust which forms on the surface begins to crack. This process, termed *levage* (rising), is peculiar to the district, and is followed with the utmost care. The wine is constantly watched by a skilled cellarman, who calls assistance at any hour

of the night or day to draw off the must at the exact stage chosen, and to run it into freshly-sulphured hogsheads. At this stage it is almost brilliant. The crust and lees are most scrupulously separated from the clear must, and are bagged and filtered, and added to the last pressings. The principle of this process is yeast starvation, which permits the retention of a maximum amount of sugar in the wine until the time when the cold of winter completely checks fermentation. No very violent fermentation ever takes place. Should it do so by chance, the wine is forthwith counted as spoiled, and not of fine quality. This slow fermentation at a very low temperature continues for several weeks. The ancient method was to then fill up the hogsheads to the bung and wait until the wine cleared before racking. Modern methods interpose a preliminary racking into well-sulphured clean casks the moment that the first fermentation ceases. The wine becomes bright during the winter, and is at once racked. It is again racked before the temperature rises in the spring. The peculiarity of these wines is that for the first two or even three years they ferment a little in the spring. By the fourth year this tendency must have totally disappeared, and bottling eventually takes place during the winter of the fourth year. Although Monbazillac improves rapidly in bottle, and can be consumed when five years old, yet it also stands a great age. Wines over 60 years old were not uncommon before the war, though these were said to have been recorked several times. Common local tradition is to the effect that Monbazillac destroys corks very rapidly. From the above it will be seen that the method of production is very costly and conducive to very small yields, while the method of manufacture has obvious difficulties. In the first place, temperature plays a most important part, as it may dry up the berries into raisins. Invariably have the wines turned out superlative when this has occurred. In wet seasons the result is deplorable, and the writer has witnessed the misery of persistent rain ruining a fine crop almost on the point of maturity. High temperatures in the cellar are almost unknown, for the reason that the vintage season is so much more retarded than it is with us in Australia. When they do occur, the wines ferment more rapidly, and do not retain the same delicacy as when fermented at a normally low temperature. It is quite questionable whether it would be possible to produce the highest quality wines of this type if fermented at the temperatures common in Australia.

Monbazillac is certainly among the most perfumed wines with the most pronounced bouquet in the world. With the single exception of sherry all such are fermented at a very low temperature. It would appear as though this low temperature of fermentation were essential for the production of this fine development of bouquet. On the other hand, the frequent failure, either partial or complete, to reach even a moderate standard of quality is such as to render vinegrowing in the climate of the south-west of France a doubtful commercial undertaking. Not more than one vintage in every seven can be classed as really high quality, while partial or complete failure can be expected almost every other year. The more exceptional the quality of the wine, the more infrequently it is produced. In a drier climate quite the same standard might not be reached, but a very high-class commercial standard would be the rule rather than the exception. North of the Dividing Range in Victoria there are many thousands of square miles climatically bett

suited to the culture of the vine than some of the richest agricultural districts of Europe, from the commercial point of view.

Montravel.

The white wines of Montravel are produced under identical conditions to those described for Monbazillac. The chief difference lies in the sugar-strength not being so high, the resulting wines are less sweet, and can be consumed as are Sauternes and Barsac. The bouquet is somewhat similar to that of Monbazillac, and is entirely distinct from that of any other part of France. There is the same similarity in type between Monbazillac and Montravel as between Sauterne and Barsac. Occasional seasons produce musts up to 16° Beaumé, but rather under this figure would be the average of good seasons. The sugar-strength of wines, even of good vintages, is extremely variable through the variations in the secondary fermentation. Not only do these vary considerably between adjacent vineyards, but also between different pickings at the same vineyard. This variation has militated against the establishment of vineyard brands, and has led to merchants buying new wine and selling it when matured under their own brands.

Macadam.

The origin of this word appears to be connected with the famous roadmaker; it is applied to wines sold on the boulevards of large cities and consumed solely by the working classes. Macadam is a new sweet wine only partially fermented, of low alcoholic strength, and not at all brilliant. Thousands of hogsheads are sent from Bergerac and Ste. Foy to Paris every season. The fashion is purely seasonal, and lasts from the commencement of vintage for about two months. Each cask is carried bung up, with a hole bored in the bung, to let the gas escape, in which are fixed ears of wheat or barley,which prevent any dirt from getting in. The casks are distributed from the railway terminus to the retailer, who taps them and sells this milky and fermenting wine by the glass, in manufacturing and industrial centres chiefly. Workmen take a glass of this either on their way to work, with a crust of bread, or else at their dinner hour, and before their midday meal. The custom of drinking this new wine appears to have originated from a belief in the medicinal value of the yeast in the fermenting wine; it only began to be fashionable about 50 to 60 years ago in Paris and in manufacturing districts. Centuries before this, local custom gave considerable prominence to the consumption of new white wine with roasted chestnuts when sitting round the fire at night.

Chestnuts enter largely into the dietary of the peasantry, and are used much as we would use sweet potatoes. In the forest of the Perigord, cakes made from chestnut meal are used to take the place of bread, but the great sweetness does not attract the uniniated any more than does the sweetness of Macadam. The theory put forward by the writer for this craving for sweet wine at the first touch of autumn cold is that the ordinary dietary—particularly that of the summer—contains so much acid in both food and drink that there is a natural reaction. Whether this is correct or not, the fact remains that the demand was very large for this sweet wine at from 1s. 3d. to 1s. 9d. per gallon straight from the press almost, which was, before

the war, considerably in excess of the price paid for dry wines in the same localities.

Bergerac.

Sold under the names of Bergerac and Ste. Foy are a long list of dry white wines of much distinction and containing a generally lower percentage of acidity than is usual in France. These are produced chiefly on alluvial soil, in distinction to the sweet wines, which are produced on clay and limestone. As in all river valleys there are great variations of soil, all of which affect the quality of the wine produced from them. A relatively small area of rich river flats, which yield quantity rather than quality, have been planted in vines in the Valley of the Dordogne, owing to the great results obtained from tobacco and maize and forage crops without any waiting for returns, as in the case of the vine. The plain land between Castillon and Bergerac is one of the greatest examples of intense culture in Europe. The vine is grown chiefly where such cultures are not possible, on hill sides and on soils difficult to work.

White Wines from Red Grapes.

Although this article is intended to describe better-known types of white wines, yet it would not be complete without reference to a very large production of sweet white wines made from red grapes, which were shipped to the sparkling-wine districts for conversion into champagne and other similar wines.

Before the delimitation of wine-producing districts in France, many firms producing sparkling wines imported from Bergerac and Ste. Foy as much as, or more than, they produced from their own vineyards. These relatively heavy wines were blended with the acid productions of badly-ripened grapes from the colder northerly vineyards, and formed a very considerable part of the export trade in French sparkling wines. They could never hope to imitate, or to replace, the famous growths of Epernay, Ay, or Reims; but, since their introduction into certain localities has been stopped, prices of wine from delimited areas have soared to unheard-of heights without any compensating increase in quality. It can only be a matter of time before the production of sparkling wines will be established upon a large scale in the Valley of the Dordogne, as the wines are naturally adapted for fermentation in bottle.

General Conclusions.

It will have no doubt occurred to the reader that the above notes refer to a district of abnormal agricultural richness. In a climate in which tobacco and maize grow to perfection without irrigation, it is obvious that there must be an excess of moisture for the vine. The average rainfall is over 40 inches, which is less than that of the Médoc, and in consequence the vine will thrive on extremely poor and shallow soils. Every possible inch of ground is cultivated, and the vine yields by far the most important crop, although the persistent fight against fungus diseases makes the cost of cultivation remarkably high. There are never less than three sprayings with copper mixtures for mildew, while five to seven annual treatments are quite common. The same is the case with sulphuring against oidium. At present prices of

chemicals, and at present rates of labour, these annual fungicide treatments become a first charge so heavy as to jeopardize the commercial prosperity of vine-growing, even at the astonishingly high rates for wine now ruling. Many growers claim that they have the greatest difficulty in showing a credit balance in normal seasons. It is of interest to note that, for the 100 years ending 1914, one writer apportions the quality of the production of wines in the south-west of France, as follows:—

	White Wines.	Red Wines.
Very good	15 seasons	18 seasons.
Good	17 seasons	21 seasons.
Fair	16 seasons	11 seasons.
Ordinary and poor	37 seasons	26 seasons.
Bad	15 seasons	24 seasons.

It would not always be possible to make an estimate for a large district with any accuracy.

Looking upon the above figures as a general estimate of quality, the percentage of poor and bad-quality seasons is most striking. From the point of view of quantity, the yield per acre is in excess of the Australian average. It would need to be several times greater than our average in order to compare commercially with Australia, and yet the average yield of the Gironde is under 250 gallons per acre. The 1919 vintage—the largest for many years—is estimated at 326 gallons per acre.

It is by making comparisons with the wealthiest districts of Europe that the unexploited potential wealth of Australia is made so apparent. From the point of view of climate, Australia possesses thousands of square miles of country more suited by nature for the culture of the vine than the most famous and historic wine-producing centres of the Old World.

GUM TREES IN SOUTH AFRICA.

In forestry many valuable results have been obtained in almost every part of the Empire. Take, for instance, the black wattle (*Acacia decurrens*, var. *mollis*) industry in Natal. Here is a case of a tree considered a forest weed in Australian eucalyptus forests, yet in the suitable climatic conditions obtaining in that province has been a great source of wealth, not only from the tannin produced by the bark, but also from the timber so extensively used as mine props, poles, building material, fuel, and boxes for various purposes.

The common European white poplar (*Populus alba*), widely distributed over the farms of the Cape Province, came into its own during the great war, and has been almost the sole source of supply for splints in the manufacture of matches. Were it not for the abundance of this timber, it is probable that the homely match would have been a luxury only the wealthy could afford. Besides being useful for matches, the timber is extensively used for fruit boxes.

Extract from an article "Why Grow Trees?" in the Rhodesia *Agricultural Journal* for April, 1920.

TOP-DRESSING PASTURE LANDS.

Good Results in the Portland District.

(By J. S. McFadzean, Senior Dairy Supervisor.)

When once a dairy-farmer comes to recognise that good pasture grass is the best and cheapest crop he can grow, he is on the right way to make his farm profitable. Excepting possibly lucerne, all fodder crops call for regular annual cultivation and seeding, as well as harvesting. If properly cared for, a good grass crop is possible every year from only one cultivation and seeding in several years, while the bulk of the harvesting will be done by the stock with little or no waste, but land sown to grass should have an annual dressing of some fertilizer if a full crop is to be raised.

Most farmers will endeavour to get good yields from fodder crops by following a definite system of fertilizing, but very few indeed ever realize that their grass land is quite as much in need of fertilizing as land under cultivation. That there are some exemptions to this rule has occasionally been shown by instances recorded in this journal, and they certainly demonstrate the opportunities awaiting so many farmers if they would but give attention to this side of their fodder supply.

At Allestree, 6 miles out of Portland to the east, is the farm of Mr. W. Cook, containing 266 acres, subdivided into twelve paddocks. Some fifteen year ago all but about 15 acres of this land was in a very rough unimproved condition, but it has gradually been cleared of timber and undergrowth until now about 200 acres are growing good grass, and last year the dairying returns averaged £17 per head from butter fat for the whole herd of twenty-four cows.

The striking feature of the land in this locality is the abundance of strawberry clover. On Mr. Cook's farm it was first noticed about eight years ago after an experimental top-dressing of superphosphate had been given some grass land. Soon afterwards strawberry clover began to make good growth, showing strongly through the rougher grasses which had previously covered the ground. As this top-dressing gave such good results it was extended each year until now a fair proportion of the grazing land of the farm has been treated, and its carrying capacity is greatly increased.

From the way the strawberry clover developed here, consequent on the land being top-dressed, it is evident that it must have been established for very many years, but had been unable to show out from amongst the coarser native grasses until stimulated by the superphosphate dressing. After the application of the fertilizer the clover came on strongly, and is growing thicker each year.

No one appears to know anything of the introduction of strawberry clover into this district, but it is so very widely spread that its coming must date back to the early settlement, having been introduced by the pioneers of, possibly, the early "forties." Once started the plant would spread over a wide area through the seed being carried by stock and flood waters, to ultimately show itself in its luxurious abundance when clearing and cultivation had given the required conditions. An instance of the tenacity of this plant was some time since

mentioned in connexion with the Sparrowvale farm at Geelong, where it has established itself so firmly that it displaced a strong growth of lucerne on the grazing areas, yet the carrying capacity of the land was not reduced in consequence.

Mr. J. Cook's Cows.

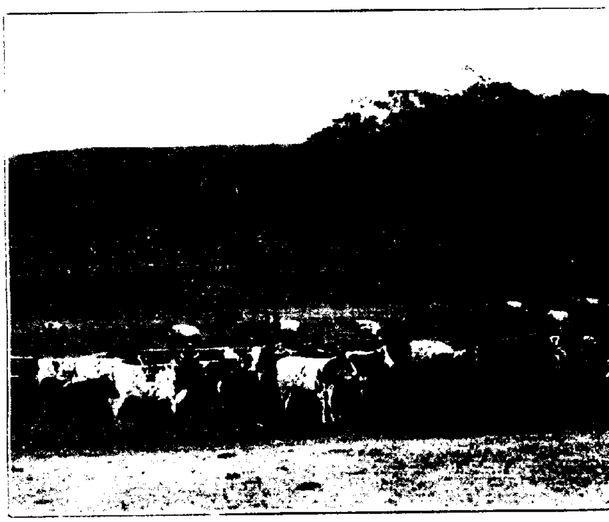
First and Second in Butter-fat Test at Portland Show, February, 1920.

Mr. Cook has been very successful in the dairy cow class at Portland shows. In 1919 his cow "Mottle" was placed first with a yield of 2.42 lbs. of butter fat for the day; another of his herd, "Jean," being fourth; while this year "Jean" was first with a yield of 2.26 lbs. of butter fat for the two milkings. The dam of the bull now in use in the herd was the winner at both the 1917 and 1918 shows, and has a record of 2.49 lbs. of fat for the day.

Some 2 miles nearer Portland and close to the Portland Bay beach road is another well-managed farm which is owned and worked by Messrs. E. and A. E. Taylor. The farm has an historic interest, being part of the 2,000 acres selected by Mr. Edward Henty, the pioneer of the Western District, shortly after landing at Portland from Tasmania; and the late Mr. William Taylor—father of Messrs. E. and A. E. Taylor—was overseer of Mr. Henty's property for twenty years. When Mr. Henty decided to sell this property he gave Mr. Wm. Taylor the first choice of any portion of it, and the 240 acres then chosen has been the property of the family ever since.

A good supply of water seems to be obtainable throughout this district. At Mr. Cook's it was struck at a depth of 16 feet from the surface. On the farm of the Messrs. Taylor there is evidence of a splendid underground water supply, and in one of the paddocks a spring opened at the direction of Mr. Henty sixty-five years ago has

not since been dry. Most of the farm is on a strip of land about ½ mile across, which lies between the hills and the beach. In its natural state it was covered with eucalyptus and tea-tree, but having been cleared and broken up is now carrying a good sole of rye grass and clovers. Portions of these flats are of a black sandy loam, and lying somewhat higher than the rest, the grass comes away there earlier than on the lower portion, but on this latter it comes on well later in the spring; and, lasting longer, gives a good and continuous summer growth. The property is subdivided into nine paddocks, and 14 acres of the grass land was top-dressed with fertilizer during the past year. Each year on some portion of the flats the rye grass and clover is cut for hay and stored for winter use.



Heifers on the Farm of Messrs. E. and A. E. Taylor, Allestree, Portland.

A portion of the crop from the 20 acres cultivated further assists in the maintenance of the milk supply from the twenty-three head of dairy cows, and they consequently give a long milking season, invariably holding well on towards their next calving. Five years back the herd was tested over several months to ascertain the individual production of the cows, and as the result some 20 per cent. were culled out, leaving the herd showing an average test of 4.8 of butter fat. Subsequently a bull of the Gowrie Park strain was purchased, which herd is one of the highest yielding and best testing lines of Ayrshires in the State. Now Messrs. Taylor Brothers have also a Jersey bull from the St. Albans stud at Geelong, whose dam gave 943 gallons of milk and 523 lbs. of butter fat on the official 273 days' test.

At the last Portland show Messrs. Taylor Brothers exhibited ten head of cattle, and secured eight prizes, including that for the champion bull of the show.

Messrs. E. and A. E. Taylor's Ayrshires.
Winners at the Portland Show, February, 1920.

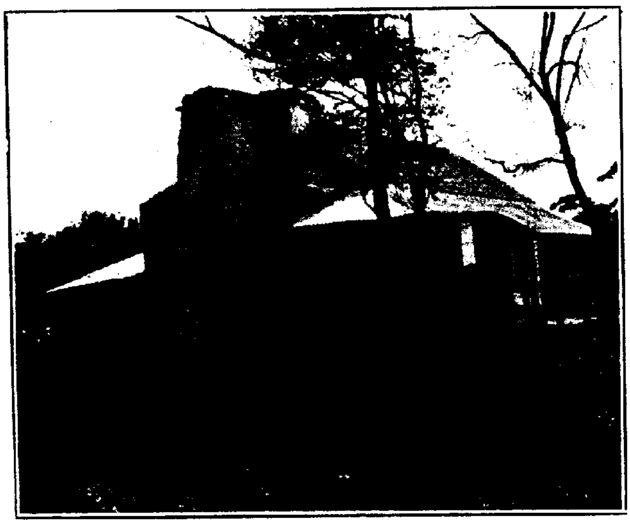
Most of the heifer calves are raised, and all surplus skim milk is well utilized in feeding the progeny of three brood sows. These three are a Berkshire and Yorkshire cross, and are particularly good mothers, having reared among them thirty-three out of thirty-five pigs in their last litters. The barley for topping off the pigs is also grown on the farm.

The dwelling at this homestead — weatherboard, with attic rooms—is said to have been built and used by the Henty family when they first landed there, yet it is still neat and trim, and in very good repair, but in all probability the quaint old stone and mortar structure shown on page 412 is of earlier construction than the dwelling at present in use. From its rough but substantial architecture, as well as the age of some of the trees in the yard behind, there is every probability that this old place now used only by rabbit-trappers or other casual bushworkers outdates all other relics of the early settlement.

Another instance of top-dressing grass land in this district is seen on the small farm of Mr. E. G. Thomas, of North Portland. During 1919 thirteen cows were milked here on 35 acres, and returned nearly £15 per head for butter fat alone, two of the herd being two-year-old heifers and two three years old. Beginning eight years ago all the land on this small farm was broken up and cropped at the rate of about 6 acres per year. Crops of potatoes and of oats were taken off each 6-acre lot before it was left for grass, and subsequently each lot was

top-dressed annually with 1 cwt. of super and bone mixture. This year the place is carrying sixteen head of milkers, and they are in good order and doing satisfactory work.

Instances such as these show that while hundreds of farmers throughout the State are neglecting to give attention to their grass



First Homestead on Land Selected by Mr. E. Henty.

land, others are finding it very profitable work. And not only in increased grazing is there very definite return from top-dressing, but experience has shown that stock running on well-cared for pasture land is better in health, sounder of constitution, and altogether thrive better than those on worn-out land. Well-grown pasture is the best of nourishing food for dairy stock, and every farmer and grazier should give full attention to the annual grass crop. Certainly no other cropping will give him more profitable return for his work.

TOMATO DISEASES.

By C. C. Brittlebank, Vegetable Pathologist.

"Bacterial Wilt."

Bacillus solanacearum, E. F. Smith.

This is the cause of the well-known potato disease "Sore Eye" or "Wet Rot." In the tomato, as well as in the potato, there is a sudden wilting of the plants, the result partly of the water supply being cut off by the blocking of the water-bearing vessels by the bacteria and their products.

All wilted plants should be removed and burned as soon as observed. Land on which this disease has occurred should not be used for tomatoes, potato, capsicum, or tobacco crops for an interval of two or three years. The disease can be carried from diseased to healthy plants by gnawing insects. For the control of insects, spray with 2 lbs. of arsenate of lead in 50 gallons of water. Fortunately, "Bacterial Wilt" is not, so far, common in the tomato fields of this State.

Irish Potato Blight.

Phytophthora infestans, De Bry.

In the drier portions of Victoria, Potato Blight has not caused any considerable loss to tomato-growers. Besides the potato and tomato, a native solanum, *Solanum aviculare*, has contracted the disease.

Weather conditions are the predominant factors in the spread of this disease. Heavy continued rains in January, February, and March with cloudy muggy weather are favorable to the development of potato blight in the tomato. As a rule, the fruit is more commonly attacked than the leaves.

On the leaves, dark-brown or black blotches appear, generally at the tips or sides. On the undersurface of these diseased areas a fine greyish-white mould will be noticeable if the weather be warm and moist. This mould is composed of upright branching filaments, on the free tips of which are borne numerous lemon-shaped sporangia.

Dark streaks will show on the stems and leaf stalks—these, as well as those on the leaf, extend until the whole plant is black and dead. On the fruit, slightly-sunken irregular areas appear—brownish-red in colour—and of a varying size. If the fruit be cut through, the flesh will be found to be brownish and mottled, and somewhat firmer than the healthy fruit. Spraying with 8, 10, 40 copper-soda should not be delayed if the disease is observed, and it is better to anticipate it and spray to prevent rather than to wait until the disease is present.

Climatic conditions favorable to the development of Potato Blight also favour the development of other diseases which attack tomatoes. Spraying should be carried out whenever weather conditions permit.

Wilt, "Sleepy Disease."

Fusarium lycopersici, Sacc.

The sleepy disease is caused by a parasitic fungus, *F. lycopersici*, Sacc., which gains entrance into the plant through the roots. Plants are liable to attack by this fungus at all stages of growth from the time they are seedlings until they are in full fruit. Young plants when attacked fail to keep pace with the healthy ones in growth; their leaves assume a sickly yellow, and the lower ones fall. Other plants show the effects of the disease when the first cluster of fruit is about to ripen, and it is seldom that any plants attain a greater development, the last symptom being a sudden wilting, and death quickly follows. When the fungus has gained entrance into the tissue of the plant it cannot be controlled, and plants should be destroyed as soon as it is seen they are contaminated.

In some tomato-growing countries the sleepy disease or wilt has caused very serious losses, and it is common to have every plant in large blocks killed off just as they are coming into bearing. Fortunately, however, neither the Bacterial nor the Fusarium Wilt has yet caused any marked loss in those districts of our State most suited to tomato culture. Every care should be taken, therefore, to check the first outbreak. When once the Fusarium has invaded the soil, it is most difficult to eradicate, soil treatment being too expensive. The only means of clearing large areas is by rotation of crops; and, as the fungus is known to remain in the earth for seven years, it would be a great loss to growers for tomato land to lie idle for this long period.

Target Spot.

Alternaria solani (E.M.) Jones, et. Grout.

This disease is one of importance to the tomato grower. Plants may be attacked at any stage of growth, from the seedling to the plant in full bearing.

Symptoms of attack are—On the leaves well-defined and more or less circular spots develop; these rapidly increase in size until in cases of virulent attack they become confluent.

If the spots be carefully examined they will be found to be marked by concentric rings, hence the common name "Target Spot." These rings indicate the stages of growth made by the fungus within the tissue of the leaf.

On the stem and leaf stalks black or brownish-black streaks and spots show. Later, the whole plant assumes a sickly yellow colour, with the leaves blotched yellow and folded inwards.

Fruit affected by "Target Spot" develops sunken or depressed spots and blotches beneath the skin. In time a dark mould appears on the diseased spots, and the fruit rapidly decays.

Control—Cultivate and stimulate the growing plants, for usually the disease is in part due to their want of vigour. Spray with 6.9.50 copper soda as soon as the disease appears. A second spraying must follow within seven days, and a third later, if necessary.

Good results have been obtained by the above-mentioned method of control. At one place several thousand bearing plants, under glass, were badly attacked. They, as well as the glass, benches, and floor of the house were sprayed as directed, with the results that the disease was completely controlled, and did not appear in the tomatoes grown in the house during the same or following year.

Spotting of the leaves and stem is a feature of this disease, as well as in the one known as "Spotted Wilt"; therefore, care should be taken in examining the leaves to ascertain if the spots show the concentric rings. Spots caused by the "Target Spot" are much more definite than those caused by the "Spotted Wilt." Spraying with copper soda has no effect on "Spotted Wilt."

SEEDLING DISEASES.

There is no period in the life-cycle of the tomato more critical than that of the seedling stage. The treatment given in the initial stages of the life of a plant or animal has a marked influence on its ultimate success. This is more noticeable in short-lived plants than in those which attain a great age. Consequently, better yields may be looked for from vigorous tomato plants than from those which have been checked by disease while seedlings.

It should be the aim of the grower to raise clean plants; to this end he must use every care to see that the soil of the seed bed is freed from fungi liable to attack seedlings. This can in a great measure, be attained by sterilization of the soil by steam, or by using virgin soil to which an admixture of lime has been added. Steps should be taken to exclude diseased material from previous crops gaining entrance to this soil. Many growers foolishly use the same earth in the seed beds year after year, and when new beds are required old dead tomato plants are collected and mixed up with the soil. Such practices will bring about conditions under which it will be impossible to produce healthy plants. In those districts where the extensive and intense culture of the tomato is practised, diseases will be more common and more difficult to control than in the past. This is due to the fact that there are many more centres of infection from which the disease can spread to the adjacent blocks.

Root Rot.

Rhizoctonia solani, Keuhn.

One of the most destructive seed-bed troubles is caused by the fungus known as *Rhizoctonia solani*, Keuhn. This is essentially a soil-inhabiting fungus; therefore, earth containing it, if used for seed beds, will produce diseased seedlings if the temperature and the water-content of the soil be high.

Unfortunately, quantities of the soil used in the suburban districts for seed beds is naturally infected, and consequently many of the young plants when sold fail to thrive, or remain stunted and produce a light worthless crop.

Seedlings in their early stages when affected by Rhizoctonia have the edges of the leaves folded upward and inward, their tips purple or bluish-purple. Later, the plants rot at slightly below the soil

surface and topple over. This severe form of attack may affect a few plants scattered through the seed bed, or it may spread outward from the center of infection, killing all the plants in the bed. In milder attacks, the plants remain stunted, with the lower leaves yellow, the upper folded inwards, and the crown leaves crowded and slightly rigid and of a greenish purple.

If the roots of one of these plants be carefully examined, very fine dark-brown threads will be observed; they will also be noticeable on the underground stem and at the collar of the plant.

Microscopic examination of the roots in section will show that the fungus has invaded the cells, causing injury and death to the invaded roots, but not to such an extent as to kill the plant. Experiments carried out with a like number of diseased and healthy plants gave the following results:—The yield from the diseased plants was seventeen and a half times less than that taken from healthy bushes. Thousands of slightly diseased plants are sold annually round the suburbs of Melbourne, and this may account for the many failures to obtain a good return.

Control measures are of little or no avail where plants have their roots invaded by Rhizoctonia. Soil sterilization by steam should be carried out if possible. If this cannot be done, lime should be mixed with the soil at the rate of 1 cwt. to 5 cubic yards. The mixing should be done about six months before the soil is to be used. After mixing the lime, the soil should be turned over at least twice before it is brought into use. Water should be used as sparingly as possible, and the temperature kept between 68 to 72 deg. Fahr. The control measures suggested have been followed by several of the largest growers of tomato plants with perfect success. "Root Rot" in former years destroyed many thousands of seedlings, but at the present time no loss occurs in the houses where the above directions are carried out.

Damping Off Disease.

Pythium de baryanum, Hesse.

"Damping Off" is another disease which attacks young tomato and other plants.

Symptoms: The plants appear sickly, soon decay at the collar, and fall over and perish. The roots, as a rule, are not injured, the point of attack being just at or below the soil surface. Whole trays are killed off within a few days. As the fungus remains in the soil for some considerable time, the trays and soil should on no account be used again until they have been sterilized.

When this disease appears among seedlings, it can be taken as a sign that too much water and too little ventilation have been given, and that the temperature has been kept too high.

"Damping Off" is often difficult to control, but favorable results have been obtained by a heavy drenching of the plants and soil with 6 lbs. of bluestone and 9 lbs. of washing soda in 100 gallons of water, or by dusting the plants with sulphur. This treatment, together with careful watering and good ventilation, should hold this disease in check.

SMALL FRUIT CULTURE IN VICTORIA.

By A. A. Hammond, Orchard Supervisor.

THE LOGANBERRY *continued.*

Training Methods.

There are several systems of training the loganberry. The system now generally adopted in commercial plantations is that of training the canes on a wire trellis. One, two, and sometimes three wires are

Fig. 5.—Loganberry Trained on the Fan System. (The height of the trellis is 5 feet, and two or three wires are used.)

used, but the cheapest and most satisfactory trellis for commercial plantations is the one wire trellis. The advocates of two or three wire trellis claim that by the training of the vines on two or more wires the canes are enabled to be spread out, and this results in increased fruitfulness, whereas with the one wire system the canes, being crowded, many fruit laterals are suppressed. It is found, however, in practice

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that any slight advantage gained in this way is more than counter balanced by the extra cost of the trellis, the increased cost of putting up the canes and in the harvesting of the berries.

Mr. W. C. Murfet, of Ringwood, who has the largest plantation of loganberries in Victoria, states that an acre of plants can be put up on the rope system by one man in a week, while it takes four weeks to put up an acre on the fan system. The rope system of training may be practised on two or three wires, as is sometimes done, particularly in the case of very vigorous plants, or a combination of the fan and rope system or the weaving system. In private gardens or small plantations, where labour is not an important factor, the more elaborate methods could doubtless be practised with advantage, but when grown commercially on a fairly large scale the cheaper and simpler system is advocated.

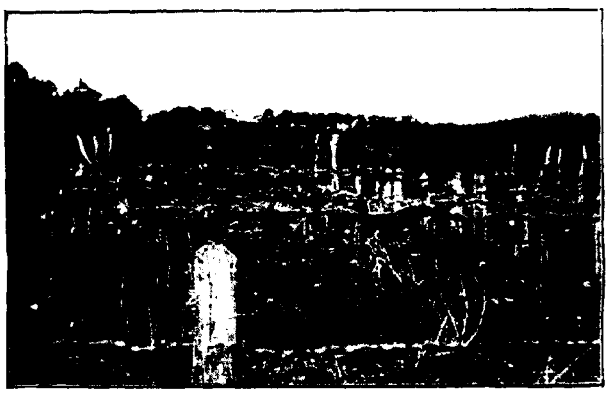


Fig. 6.—Loganberries Trained on the Rope System. A single barbed wire 3 feet 6 inches from the ground.

The height recommended for a single wire trellis is from 3 feet to 3 ft. 6 in. Posts about 5 feet long, sunk 2 feet in the ground, are placed 15 feet apart in the rows, the distance between the rows being from 6 to 8 feet. The end posts must be braced as shown in Fig. 5. At times the posts are placed at intervals of from 20 to 30 feet in the rows, but this is not recommended as trellises so constructed are not sufficiently rigid. Galvanized barbed wire is then strained taut and stapled to the top of the posts. The advantage of using barbed wire is that the canes are held firmly in place by the barbs, and are not blown about by the wind when carrying a crop of berries, as is the case when plain wire is used.

The canes may be tied up at any time during the winter. When tip plants are required this cannot be done before the end of June. The canes are taken up in a bundle and wound around the wire in one direction, as shown in Fig. 6, and are cut or broken off and tied before reaching the next plant in the row. This method of training is called the rope system. The fact that some buds are suppressed by the ro-

system of training is compensated by the increased vigour and fruitfulness of the remaining buds. Half the canes of a plant may be trained in one direction and half the other, but there is no advantage in doing this, and it takes more time than training in one direction.

To enable cultivation to be carried on during the summer it is necessary to train the growing canes along the ground close to the trellis. The canes are kept in place by clods of earth, a shovelful of soil on a few pegs. The training of the growing canes as described is necessary, not only for the purpose of cultivation, but later, when the berries are being harvested, the canes, if allowed to spread over the space between the rows, would be trampled upon and injured by the pickers.

Fig. 7.—Training Canes on a single barbed wire on the Rope System.

Pruning.

The pruning of the loganberry is very simple. It consists in removing the old canes immediately after fruiting, the shortening back of canes, if required, when wound around the wire so that one plant will not be allowed to encroach on the space of the next and the cutting out of any weakly canes. Lateral growths may be cut back to a few buds or completely removed.

The usual number of canes produced by a plant is about eight. Vigorous plants may produce a dozen or more canes when well established, and weakly ones only four or five.

When cutting out the old canes, which die after fruiting, care should be taken to cut them as close to the crown as possible. The prunings should be collected and burnt immediately after pruning to prevent any diseased old canes from infecting the new ones.

Manuring.

There is no better fertilizer for loganberries than stable manure. In soils that are rich in humus the use of this manure is not so important, but in soils lacking humus, stable or other nitrogenous organic manure is essential. Stable manure is valuable not only because of the plant food which it contains, but also because of the physical improvement which it effects on the soil. The capacity of the soil to hold capillary water is increased. It also allows of better aeration, and increases bacterial activity, which results in the liberation of plant food that would otherwise remain insoluble. Stable manure varies considerably in its composition, but good manure is rich in nitrogen and contains a fair percentage of potash and phosphoric acid.

The quantity of stable manure required per acre is dependent on the nature of the soil. The application of 10 tons per acre may be considered a fair dressing. On poor land 20 tons per acre would not be too much. The manure should be spread over the land between the rows and ploughed in after the canes have been put up. A dressing in spring and a summer mulch greatly assists in the conservation of moisture. This is recommended on land deficient in humus, especially in the drier districts. Green manuring is a good substitute for stable manure. Field peas or tick beans should be planted in autumn before the land gets too cold, and the green crop ploughed under in spring when in bloom. Owing, however, to the comparatively narrow spaces between the rows the proper management of a leguminous crop is difficult.

The cover crop should be manured, and the manure recommended for this purpose is as follows:—

Bone dust or dried blood ..	150 lbs.
Superphosphate	600 lbs.
Sulphate of potash	400 lbs.
	1,150 lbs., or, roughly, 10 cwt.

Which should be used at the rate of 3 cwt. per acre.

As potash is almost unprocurable at the time of writing, bone dust or dried blood, or a mixture of both and superphosphate in the proportion of three of super. to one of bone dust may be used. If applying manure direct to the loganberries a good artificial fertilizer is a combination of two parts by weight of bone fertilizer, one part of superphosphate and one part sulphate of potash. Apply at the rate of 5 cwt. per acre.

Harvesting.

The loganberry begins to ripen about the third or fourth week in November in the southern districts, according to the season, and continues for about six weeks. In picking for the fresh fruit market it is desirable to go over the plants every second day, otherwise there is a danger of the berries becoming over-ripe. When intended for the jam or cordial factory picking twice a week is sufficient, unless the berries have to be sent long distances, in which case a firmer sample is required. The medium ripe berry is of a bright red colour, and the fully ripe a dark red. The medium ripe berries, of course, carry

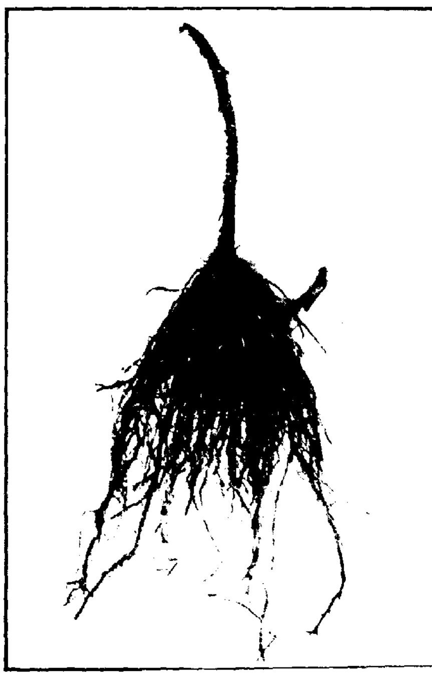


Fig 8.—A Good Specimen of Tip Plant. This plant was produced from a cane rooted in May, and was lifted on the 6th July following.

much better than the fully ripe ones, and the degree of ripeness when they should be picked depends on the distance from the market and the condition in which they can be landed there.

When intended for jam or a beverage the berries should not be picked until fully ripe. Such berries make better jam, and there is no hard core as with immature fruit. When intended for the manufacture of a beverage, it is essential that the fruit be allowed to ripen on the canes. Fully ripe fruit is more necessary for the manufacture of a beverage than for any other purpose.

In this connexion the following tables published by Messrs. Lewis and Brown, of Oregon Agricultural Experimental Station, United States of America, is of interest:—

TABLE I.

EFFECT OF THE RIPENESS OF LOGANBERRIES ON THE QUALITY OF THEIR JUICE.

Sample.	Ripeness of Berries used.	Percentage of Juice obtained.	Rank according to Quality.
No. 1	Immature ..	59.3	Fourth
No. 2	Medium ripe	71.8	Third
No. 3	Ripe ..	71.8	First
No. 4	Over ripe ..	78.1	Second

TABLE II.

COMPOSITION OF THE JUICE OF THE LOGANBERRY.

Juice obtained from	Specific Gravity.	Acidity.	Total Sugar.
		per cent.	per cent.
No. 1. Immature berries	1.032	2.06	3.50
No. 2. Medium ripe berries	1.0395	2.10	4.91
No. 3. Fully ripe berries	1.045	1.88	6.40
No. 4. Over ripe berries	1.040	1.78	6.46

It will seen from the above tables that both the sugar content and juice are much greater in the fully-ripe fruit than in immature fruit. There is not much difference in the juice content of the medium and the fully-ripe berries, but there is a considerable difference in the sugar content. The number of pickers required, of course, depends on the crop, but about five per acre are usually required to keep pace with the ripening berries. It is best to pick in the cool of the morning, especially when dealing with the fully-ripe berries. In large plantations, however, this is not practicable. In the cool of the morning the berries are firmer and separate more readily from the stem, and thus may be plucked with less danger of crushing.

Each picker should be supplied with a hand carrier. The carrier shown in Fig. 9, which holds eight punnets, is a handy size, and is easily made. Carriers attached to the waist are sometimes used, but the objection to these is that the berries are often spilled when the picker stoops low in picking. Care should be taken to keep the berries in the shade when picked, as they are spoilt if left standing in the sun.

Figure 10 shows a 40-punnet crate, which is used in sending berries to the fresh-fruit market. There are five tiers, each containing eight 1-lb. punnets. A tray or slide which is cleated separates the punnets in each tier, the cleats resting on the rim of the punnets. This arrangement prevents the crushing of the berries. Wooden buckets, such as are used for raspberries, are used when sending berries to the factories.

By Products.

The loganberry can be put to several commercial uses, including the making of a very fine beverage. The following extract from

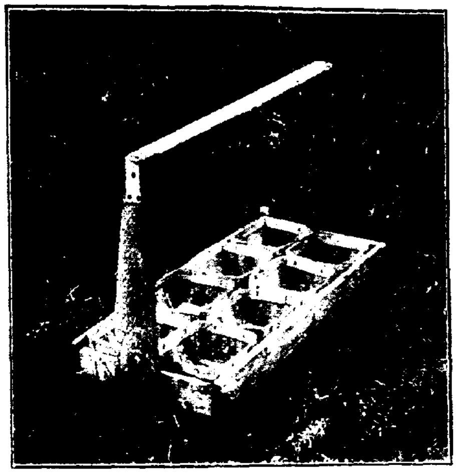


Fig. 9.—Hand Carrier for Loganberry Picker.

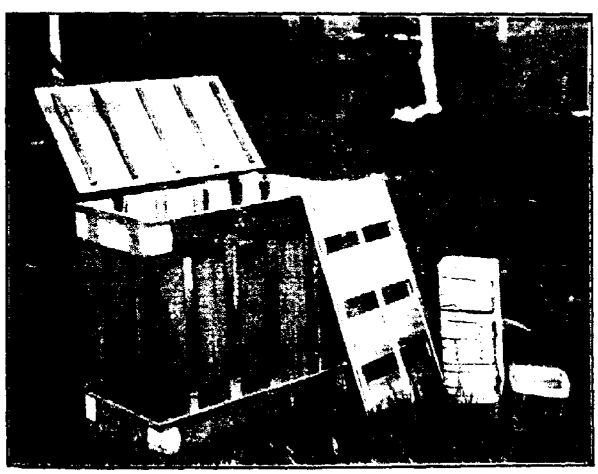


Fig. 10.—Forty-punnet Crate for Sending Berries to the Fresh Fruit Market.

circular No. 54, issued by Department of Agriculture, British Columbia, is of interest in this connexion:—

Home-made Loganberry Juice.

Citrus fruits contain citric acid in their juice, which acts as a tonic to the human system. Chemical analysis shows that the acid

content of the loganberry is chiefly in the form of citric acid, and for this reason the juice is very pleasant and healthful. In the home as a beverage there is nothing more palatable. Because the logan has so many favorable qualities the reputation of its juice has now spread over the entire continent.

The juice is now manufactured commercially in large quantities in Oregon, but at present there are no commercial plants in British Columbia. The machinery is very expensive, and the pipes through which the juice passes must be silver lined to prevent the action of the citric acid.

For home use a practical formula is as follow:—

Use berries which were left to become dead ripe on the vines. When perfectly ripe the berries contain more sugar than at any other time, and the juice then has the best flavour and aroma. When dead ripe the berries contain about 78 per cent. juice; when medium ripe only about 70 per cent.

Press the juice after crushing them thoroughly. If a press is not available, they may be put on a stove with 1 inch of water in the bottom of the pan and heated, *but not boiled.* Then place them in a flour-sack and wring the pulp dry. After this the juice is ready to pasteurize by heating to about 200 deg. Fahr. *Caution.*—Do not let the juice boil. While pasteurizing the juice the glass bottles or jars, tops, rubber rings, corks, &c., should be sterilizing in a pan of nearly boiling water. Sterilize the cup or ladle used for dipping out the juice. Do not touch with the hands any of the equipment to be sealed.

When the juice is nearly boiling hold the bottle with a mechanical grip over the pan of juice. Fill to within 1 inch of the top, using sterilized ladle. With a sterilized fork take a rubber ring from the hot water and place it on the jar. With two sterilized forks take a lid from the hot water. Clamp or screw the lid on firmly and the job is finished.

Notice.—The vital points throughout the process centre on thorough sterilization. If properly done, even without sugar, the juice will keep for years.

Regarding the amount of sugar, use no sugar at all if you wish. However, sugar must be added sooner or later, so it is advised that enough sugar be added when making to suit the average taste.

Juice made in this manner is too rich to drink straight. When ready to use, dilute with about three parts of water to one of the juice.

Jams, Jellies, &c.—The logan jammed alone is superfine. When jammed with one part of raspberries or blackberries to three parts of loganberries, a more palatable combination could not be desired. If early apples are available, 20 per cent. apples and 80 per cent. logans make a very good jam or canned combination. Loganberry jelly is the finest made, and has a flavour all its own. Home-dried logans are a luxury during the winter months. Before the advent of prohibition loganberry wine was equal to the finest claret.

Estimated Cost of Planting and Probable Returns from One Acre of Loganberries.

The cost of establishing a 1-acre plantation of loganberries doubtless varies considerably in different localities. The following estimate is based on figures kindly supplied by Mr. W. C. Murfet, of Ringwood:—

	£	s.	d.
Preparation of land for planting	2	0	0
Cost of 1,200 plants at 9s. per 100	5	8	0
Cultivation until first crop is harvested ..	10	0	0
Erection of trellis, labour, and material ..	20	0	0
Training vines and tying up, &c.	2	12	0
Harvesting and marketing crop	57	0	0
	£96	0	0
Estimated value of crop eighteen months after planting, viz., 7,200 lbs. at 5d. per lb. ..	150	0	0
Net return first season	£54	0	0

Rent of land or interest on the capital value as the case may be, has not been included in the cost of production as this differs considerably in various districts. The cost of manuring and irrigation are also items of expenditure that cannot be estimated. The cost of these depends largely on locality and soil.

Briefly, it may be stated that the cost of production, harvesting, and marketing may be estimated at from one-third to two-fifths of the total value of the crop, and this may be reckoned at from £200 to £300 per acre after the first year.

The profitable life of a plantation naturally depends on the care which it receives and the soil on which the plants are grown. It may be stated, however, that the average profitable life is fifteen years.

(To be continued.)

A BERRY BOOM.

The American strawberry-growers are in great glee over the enormous increase in demand and the rising price of berries, due, they believe, to the advent of prohibition. A writer to the *Country Gentleman*, without going so far as to give the whole credit for the boom to the closing of the bars, considers it an important factor.

In 1909, the last year for which census figures are obtainable, the value of the American strawberry crop was set down at £25 per acre; to-day it is anywhere from £100 to £200. "Growers are wiping out mortgages, buying automobiles, or wearing paths between their fields and the savings banks—all because a series of factors have conspired to send strawberry prices up."

FISH MANURE.

P. Rankin Scott, Chemist for Agriculture, and Will C. Robertson, Supervising Anaylst.

For many years past there has been a marked shortage of bonedust and kindred fertilizers in Australasia. In this State the requirements exceed the supply, but it must be admitted that the demand is for a low-priced manure, with the result that agriculturists in adjoining States outbid the Victorian farmer. Consequently the demand which exceeds the supply is the demand of the manure-broker or dealer, accentuated by Inter-State orders.

It is time the slogan, "Wake up, Victoria," was heard by the Victorian farming community. If a fertilizer is worth £10 per ton, plus freight (no insignificant figure) to the West Australian or Tasmanian farmer, it is surely worth the f.o.b. price to the farmer south of the Dividing Range.

It is not suggested that bonedust should be used in the northern areas. Experiments during the past twenty years have conclusively proved that the quick-acting superphosphate is the best artificial fertilizer for wheat, &c., when sown for grain in the wheat areas. On the other hand, bonedust and kindred fertilizers give marked results in the districts of Southern Victoria. Bonedust, when mixed with an equal weight of superphosphate, is particularly suitable in certain areas for the manuring of the hay crop. It gives excellent results in the case of forage and root crops, and is the fertilizer *par excellence* in market garden culture.

Its comparatively slow action and lasting effect, together with its stable composition, render it pre-eminent as a fertilizer in mixed farming operations, especially when the "mixed farm" is owned and worked by the farmer.

Continual and persistent inquiries at the Laboratory as to where bonedust, bone manures, or any material which would act as a substitute can be obtained have directed attention to the fish fertilizer industry. This fertilizer may be regarded as a substitute for bonedust, which at the present time is almost unprocurable, and should produce similar results when applied to land south of the Dividing Range. Any quantity up to 2,000 tons could be placed annually at a figure based on the analysis and the unit values in existence.

Fish manure, or fish fertilizer, is the residue obtained when fish scrap or non-edible condemned or "overflow" fish are "cooked" and pressed for the extraction of fish oil. It is a combined nitrogenous phosphatic manure of moderate availability, and may be used as a substitute for bone and blood or bonedust. When the industry was first established an erroneous impression existed that the fertilizer was practically valueless owing to the fact that the oil it contained acted as a waterproof coating to the bone and flesh particles, thereby preventing decomposition and the subsequent availability of the plant foods, viz., nitrogen and phosphoric acid. This is so in fertilizing materials contaminated with mineral oils, but animal oils are much easier oxidized or decomposed.

Of course, as the primary product in the fish scrap industry is the oil extraction, it necessarily follows that the oil content of the residue, which is subsequently converted into fish fertilizer, is reduced to the minimum. In the manufacture of bonedust the first operation has for its object the recovery of fat (tallow), but the finished article is not by any means free of fat. The same applies to the fish manure. There would not be a great deal of difference in the oil content (ether extract) of the two fertilizers.

Upwards of 100,000 tons of fish fertilizer, the dried cannery waste from fish canning after oil extraction, are annually produced in the United States of America. This product is sold as "fish scrap fertilizer."

In certain instances, the "overflow catch," *i.e.*, the fish caught in excess of the canning factory's capacity, is utilized for the extraction of oil and the manufacture of fish fertilizer. As the raw material—the fish scrap and condemned fish—is obtained for the cost of collection the industry is a highly profitable one. In New South Wales and New Zealand the fish-oil industry has obtained a footing. No data are available regarding these factories, but it is known that the one in New South Wales augments its supply of raw material from the waste of the trawling industry by the purchase of fish at a price per ton from those who care to sell. In New Zealand the factory is practically an adjunct to the canning industry.

For many years a fish oil factory was situated in Southern Tasmania, but with the death of the proprietor the industry was allowed to lapse.

The Industry in Victoria.

In Victoria an attempt is being made to install the industry in Gippsland at Lakes Entrance, where Messrs. Michelson Brothers, local fishermen, have been experimenting in a small (and exceptionally crude) manner on Rigby Island. Lack of capital is the sole reason for their rudimentary plant and its infinitesimal capacity. Oil has been obtained from sharks, stingarees, porpoise, snig, and other fish, but the work has been intermittent.

The simple method of "cooking" in an ordinary copper and subsequently "floating off" the oil in a small galvanized iron tank is followed. An attempt was at one time made to manufacture a fertilizer, but in this endeavour the experimenters made a sad mistake. The solid residue from the "cooker" was thrown aside whilst the "soup" or liquid from the oil tank was run into "slabs" of marl or soft chalk. The slabs were subsequently air-dried, crushed, and, after being mixed with 10 per cent. of the residue from the "cooker," sent out as a sample of fish manure.

A sample gave the following analysis:—

Moisture	4·30 %
Nitrogen	3·43 %
Phosphoric Acid	1·71 %

The value of a low-grade fertilizer of this description based on present-day unit values would be approximately £3 10s. per ton, and to

make a fertilizer of this description on a large scale would not be economical. The method of manufacture practised abroad is to run the "cooker" liquid (whole brew) through a filter press, allowing the liquid expressed to be carried to the oil tanks, where after the oil is "floated" off, the liquid is allowed to run to waste, the solid portion remaining in the press being dried and sold as fish fertilizer.

The fertilizer manufactured by the Messrs. Michelson at Cunninghame is really a marl or chalk reinforced with a solution of fish glue and other soluble protein substances. Whilst this fertilizer may command a ready market locally, the handling charges are so great as to preclude profitable manufacture.

However, the advisability of adding a percentage of chalk in drying is a point worthy of consideration. This plan would have the disadvantage of diluting the fish fertilizer with a consequent decrease in value. On the other hand, the chalk addition would absorb protein substances which otherwise would run to waste, might decrease the cost of drying, with the final advantage of increasing the yearly tonnage of fish fertilizer.

The method of running the "cooker" liquid through a filter press produces a high-grade fertilizer, as the following analyses show:—

—	Norwegian* Fish Guano.	Cod* Guano.	American* Dried Fish.	Salmon† Fish Fertilizer.	Menhaden† Scrap Fertilizer.
	%	%	%	%	%
Moisture	8·00	6·2	12·80	4·97	7·72
Nitrogen	9·00	7·3	7·30	8·70	8·43
Phosphoric Acid ..	10·00	11·83	8·30	8·31	6·70

From these analyses, together with the facts known concerning the fish manure already manufactured at Lakes Entrance, it is safe to assume that works properly installed and controlled would produce a fish manure of the following approximate analysis:—

Moisture	10 %
Nitrogen	8 %
Phosphoric Acid	8 %

The present-day market value of this class of fertilizer would be £9 9s. per ton.

In American factories the yield of oil varies from 15 to 25 gallons per ton of raw scrap, the quantity of oil and likewise its quality varying with class of fishes treated. Further, the oil content of certain fishes varies with the seasons. Oils from the larger fishes, such as sharks and stingarees, contain alcohols, and are particularly suitable for special blending. These oils are in great demand at prices varying from 5s. to 10s. per gallon.

It is perhaps worth mentioning that it is fish worthless to fishermen under existing circumstances that may be most valuable for the purpose

* H. Ingle, F.I.C., F.C.S., *Manual of Agric. Chem.*
† Bulletin 150, U.S.A. Dept. of Agric.

of fish oil extraction and the manufacture of fertilizer. Messrs. Michelson Brothers have performed several interesting experiments as to the oil capable of being obtained from sharks, stingarees, smig, &c. A shark weighing approximately 4 cwt. yielded, on crude treatment, 6 gallons of oil, and a black stingaree of 2 cwt. gave 4 gallons. The manufactured oil was sold to a Melbourne firm at 3s. 6d. per gallon.

Within certain limits the composition of the fish fertilizer will vary with the class of fish treated, and the quantity obtained per ton of raw material will be between 4 and 5 cwt.

The Raw Material Available.

This is the crucial point. The fishing industry at Cunninghame is not of great importance, and it is extremely doubtful whether the present fleet is large enough, or its owners imbued with sufficient enthusiasm, to provide the necessary raw material even for works of a small capacity. Local authorities maintain that the present craft could easily deliver 1,000 tons of fish per annum at any fish works established at Cunninghame. The point is—Will they? There is said to be craft available equal to bringing in over 20 tons of fish per trip, and instances are quoted of 20 to 30 tons of fish being obtained in one haul. It is computed that two fishermen can catch 2 tons of fish per day.

With the immense fishing grounds extending towards New Zealand and Tasmania there should not be any difficulty in obtaining the necessary raw material, but it is a moot point whether the present fishing population with its craft of to-day, even under the best conditions, would guarantee to supply 1,000 tons of fish refuse per annum at the works at a reasonable figure. It is highly probable that the price paid per ton of fish by the management of a properly equipped fish fertilizer factory would range between 20s. and 30s. The former is the price paid in Sydney.

It is not the purpose of this article to state precisely what should be done to establish the industry. The sole objective is to disseminate certain facts which might act as a guide if the installation of a factory were being considered. If a factory be established a co-operative scheme between local fishermen (or their society) and private enterprise should undoubtedly be the basis on which to build the fish fertilizer industry at the Lakes Entrance. Should such a factory be installed there will not be the least difficulty in disposing of the products. The present quote for the lowest grade fish oil is 5s. per gallon, whilst 1,000 tons of fish fertilizer could be readily placed at the approximate figure of £9 per ton, and the demand for these commodities in Australia and abroad is increasing annually.

The various grades of fish oil have many uses. Some are used as edible oils, others for blending in lubricating and lighting oils. The paint and varnish factories absorb large quantities, and they are also largely used in dressing leather. The lowest grade oils are made into fish-oil soap (a valuable ingredient in the manufacture of fungicides and insecticides) and axle grease.

(*To be continued.*)

TURKEY REARING.

By W. C. Rugg, Poultry Foreman, Werribee Research Farm.

The rearing of turkeys for the table can be successfully carried on in the northern areas of Victoria with less trouble and expense than is generally supposed, and many wives and daughters of settlers there are earning big sums in this way. In the Goulburn Valley, for instance, large quantities of wheat, oats, and lucerne are grown, consequently there is a good food supply, and climatic conditions are particularly favorable for this branch of poultry farming.

The essentials for success are sound, healthy breeding stock, careful feeding and management of the young birds and marketing at the right time.

Pure American Bronzewing turkeys are the most satisfactory. The breeding stock should consist of half-a-dozen hens from 14 to 16 lbs. weight, mated in their second season with a gobbler not less than twelve months old, and from 24 to 32 lbs. weight. In my experience, males of this weight are more satisfactory than heavier birds of from 36 to 45 lbs., as the latter do not fertilize so well, and frequently injure the hens. Occasionally, I have had hens so badly torn on the back as to need as many as fifteen stitches.

Although it is comparatively easy to remove the spurs of the male birds, it may be found more satisfactory to use boots. Almost any saddler will make them from a bit of green hide for a couple of shillings, and with care they will last two or three seasons if taken off at the end of the breeding season, cleaned, and given a good dressing of neats-foot oil.

The boot should be made the shape of the finger of a lady's glove, of a length equal to the bird's spur, with two small buckled straps to fasten round the leg. If a wad of sole leather (a piece out of a saddler's punch) is put inside the end of the boot, it will prevent the spur from wearing a hole in the end of it. Should the bird's spurs be very sharp, the points may be filed, care being taken not to make them bleed, and the life of the boots will thereby be prolonged.

The gobbler should be a bird of robust constitution, with good, wide shoulders, long in the breast, and short in the leg. If such a bird is mated with hens of the weight stated, tight and close in feather, offspring of a suitable size to bring the best prices in the Melbourne market should be produced.

Turkeys should be encouraged to roost in trees where possible. It is good for the birds to use their wings, as it developes the muscle and makes the breast thicker. Turkeys roosting in the open air breed strong, healthy chicks, and the greater the range the stud birds have the stronger the chickens will be.

Turkey hens always choose their own nests. The eggs should be gathered daily, one being left in the nest. It is advisable to pencil the date on the eggs, so as to make sure of leaving the new-laid one for the nest egg. The eggs, when collected, should be kept in a cool place, and turned every day.

When the hen goes broody, a coop with a run attached should be placed near the house in a sheltered position on a patch of grass or lucerne. The nest should be made by putting 2 or 3 inches of soil mixed with a little lime in the bottom of the box, and a small depression made about the depth of a soup plate by patting down the earth with the hand; then a handful of pine needles or straw should be put in. The earth must be spread fairly evenly over the whole box a little higher at the edges than in the centre, and too much straw should not be placed in the nest, otherwise the eggs may roll out. The eggs should be put in the nest, and the hen placed on them at dusk, and closed in for about 22 hours; then the sitter may be given water and food consisting of either wheat, oats, or maize. After two or three days she may be let out, and can usually be relied upon to go back to the nest after having had a dust bath and a green pick. Broken charcoal and grit should always be kept near the sitting hens. Sixteen eggs are sufficient. If she has laid more, up to nine can be put under a domestic hen, which should be set at the same time. A record of the date when the hen is set should be kept by marking it on the coop, or in such other way as is most convenient. The chickens should all be given to the turkey mother, as she will make a much better job of the rearing of them. About two days before the hatch is due, the hen should be gently lifted off and given a dusting with a good insect powder, and then allowed to feed. By the time she goes back to the nest she will have got rid of any vermin with which she may have been infested. and the chicks will get a fairly clean start. Turkeys should always be handled very gently. For this reason, womenfolk are more successful with them than men. When the chicks arrive, they do not require food for at least 24 hours, but the mother should be liberally fed on any whole grain, as she will probably not have taken any food during the last day or so of the hatching. Some powdered charcoal and coarse sand or fine grit should be placed for the young ones to pick at. Their first feed should consist of oatmeal mixed with a little milk. The drier the oatmeal is mixed the better, and it must not be sticky or sodden; only about three tablespoonfuls should be mixed at a time; a dessertspoonful of milk is sufficient to take up the flour in such a quantity and prevent waste. To this mixture should be added a little coarse sand, and a teaspoonful of powdered charcoal. In fact, up to the time they are a month old, charcoal should always be mixed with their food; after that, they will eat plenty of it of their own accord, if it be available. The first drink should be new milk. It is well to place the milk in a saucer, in which an old cup has been inverted to prevent the chickens from standing in it. New milk should be the only drink for at least three days; then water may be substituted; but new milk once a day should be given for at least a fortnight, preferably first thing in the morning. After that, separated milk will do. It would perhaps be well to mention that the more milk young turkeys get the finer will be the texture of flesh.

The coop should be moved a few feet every day to give the chicks fresh ground to run on; about the fourth day, the front of the coop should be raised a few inches to allow them to run in and out, but the hen should still be kept inside. At this age, a little finely-chopped green lucerne or lettuce should be added to the oatmeal, then chopped onions

or shallots, and silver beet, milk thistles, or dandelion, will make a good change. After a week old, a little bran and pollard may be added, and the oatmeal gradually lessened till the young ones are a fortnight old, when it may be dropped altogether.

At the age of three weeks, a mash made of bran, mixed with water in which rabbits or liver have been boiled, and dried off with pollard, may be given them. To this chaffed green lucerne, rape, or other green stuff should be added. To prepare this mash, the bran should be placed in the trough and scalded with an equal measure of the soup, a bag being placed over it to keep in the steam for 10 or 15 minutes. Then pollard, equal to about twice the quantity of bran used, will be necessary to dry the feed off to a nice crumbly mixture. The green stuff can be mixed with the feed after the pollard.

Only as much as the birds are likely to pick up should be prepared. It should be fed in troughs, or on a clean bag spread on the ground, so that any food not eaten may be taken away and not left to go sour.

The chicks should be fed five or six times a day for the first three weeks. During this time, a little cracked grain may be fed to them at night. When they are a bit older, three or four feeds a day will suffice. At the end of six weeks, whole wheat and oats may be given. Cracked maize is also beneficial.

The changing of the feed should be done gradually; many a promising brood have been lost through neglect of this precaution.

Young turkeys should not be let out of their shed till the dew is off the grass. I have watched young turkeys feeding along an irrigation channel often wading half way up their breasts in water after insects, &c., and no harm resulted, but if they are allowed to run in damp grass and get wet across the back, it very often proves fatal.

They should be frequently examined for vermin, especially about the head. If any are found, a good plan is to get a small oatmeal bag, put therein some good insect powder, place a little one in it, and shake gently. This operation takes only a few seconds, and well repays the trouble.

I am indebted to Mr. Hart, the Chief Poultry Expert, for many hints on turkeys. On one occasion, he drew my attention to the very rapid growth of the flight feathers of young turkeys. This is, no doubt, a provision of nature to aid the young turkeys in fleeing from their enemies, as when frightened they use these feathers at a great rate to increase their speed. Mr. Hart suggested that if this growth (unnecessary under domestic conditions) could be diverted into the young bird's body a great improvement could be looked for. I decided to try the experiment on a few chicks, and when they were ten days old removed the six flight feathers of each wing. Chickens treated in this way developed quickly, and since then I have similarly treated hundreds, and am convinced it is a great help to them during a very critical period.

In performing the operation, great care has to be used not to injure the wing, but if the chicken be placed in the palm of the hand, and the wing held firmly between the finger and thumb, the feathers can be easily pulled out without any injury.

When the young birds are ten or twelve weeks old, a trestle frame should be made about 2 feet from the ground for them to learn to perch on. The perches should not be less than 2 inches wide, and if placed near a tree, the birds will soon learn to get into its branches. From this time on, they should always have a full feed of grain at night.

Three weeks before marketing, they should be fed on grain which has been soaked in milk for from sixteen to twenty-four hours. Some people prefer to give them boiled wheat or barley, but I think the former the better feed.

Many make the mistake of sending their birds in for sale before they are ready. It is well to remember that it is not so much size that counts with the buyer as condition. A plump, well-conditioned bird of 20 lbs. will always sell better than a large-framed, poor bird, even if he weighs a few pounds more.

It is wise to pick a reliable salesman and to send all birds to him. If birds are in good condition, he will be able to recommend them to his best customers to the seller's advantage; and once a person has acquired a reputation for sending only first-grade birds, buyers will always be on the look out for his consignments.

THE POULTRY INDUSTRY IN 1921.

By A. V. D. Rintoul, N.D.D., Chief Poultry Expert.

"What are the prospects for next year?" was a question put to me recently by the owner of a flock of slightly over 2,000 birds, and with the hatching season now commencing, it must be the uppermost thought in the minds of most poultry breeders. In the June number of the *New Zealand Journal of Agriculture* is a very educational article by Mr. F. C. Brown on the cost of feeding pullets to six months old, by which time, of course, they should be in full lay. The actual cost per pullet for feed alone worked out at 6s. 11¼d., with wheat at 6s. 8d. per bushel, pollard £9 5s. per ton, bran £7 5s. per ton, pulled oats 4s. per bushel, rolled oats £35 per short ton, and oatmeal £27 per short ton.

The article referred to is reprinted below:—

During the past season a trial was conducted at the Milton Poultry Station to ascertain the cost of feeding pullets to the age of six months. Sixty White Leghorn chickens were placed in brooder. Of these, seven died when a few days old, and of the remainder twenty-nine proved to be pullets and twenty-four cockerels. The cockerels were separated from the pullets when they had attained a weight of about 3½ lb., and the available market price for these—4s. each—was credited to the pullets, while the whole cost of feeding was charged against the pullets.

The following are particulars and actual cost of the food supplied to the chickens during the six-months period of the test:—

	£ s. d.	£ s. d.
Whole wheat, 1,008 lb., at 6s. 8d. per bushel		5 12 0
Cracked wheat, 187 lb., at 6s. 8d. per bushel	1 0 9	
Add cost of cracking ..	0 1 6	
		1 2 3
Crushed wheat, 112 lb., at 6s. 8d. per bushel	0 12 5	
Add cost of crushing ..	0 0 9	
		0 13 2
Pollard, 769 lb., at £9 5s. per ton ..		3 11 2
Bran, 254 lb., at £7 5s. per ton		0 18 5
Oatmeal, 26 lb., at 6s. 9d. per 25 lb. bag ..		0 7 0
Hulled oats, 264 lb., at 4s. per bushel ..	1 6 5	
Add cost of hulling ..	0 6 7	
		1 13 0
Rolled oats, 45 lb., at 35s. per 100 lb. ..		0 15 9
Meat-meal, 21½ lb., at 20s. per 100 lb. ..		0 4 4
Total		£14 17 1
Deduct price realized for twenty-four cockerels sold at 4s. each		4 16 0
Net total cost		£10 1 1

Dividing this sum by 29 (the number of the pullets reared), the average net cost of food for one pullet works out at 6s. 11¼d.

During the six months eggs to the value of £1 8s. 6d. were laid, but no credit is allowed for this amount, it having no bearing on the object of the trial.

NOTE.—The above-recorded experiment was carried out at the request of the New Zealand Poultry Association.

It will not be possible in Victoria to obtain feed cheaper this season than at the figures quoted, and in all probability we shall see wheat dearer next year. Consequently, counting in labour and use of equipment, pullets will be worth about 10s. each to the grower by the time they come in lay, and their cost of feed during their laying year will be fully 3d. per bird per week. It follows, therefore, taking into consideration labour, feed, housing, and equipment, interest on capital, and depreciation in value from pullet to second season hens, that each bird will cost not less than £1.

How much will each bird earn? Quite recently, one of the metropolitan daily papers in an article on the cost of living, singled out the egg market for special attack, and advised the public to hold off buying eggs so as to reduce the price. The article, so far as eggs are concerned, was distinctly misleading, as they sold at from 3s. to 3s. 3d retail, and 2s. 6d. wholesale from 29th April to 15th June, then the price fell 8d. per dozen in ten days, which represents the customary seasonable fall for the time of year, as is shown in my article, "Fluctuations in the Egg Market" in the *Journal of Agriculture* for February 1920, page 116. The price recovered 6d. per dozen by 8th July.

There is considerable danger for the future of the poultry industry unless all producers co-operate to secure a fair price for their products based on the cost of production. Let us take the case of a man with a flock of 1,000 White Leghorns in the month of June. Out of the 1,000 birds, fully 250 will be second-season birds not yet through the moult, and consequently not laying. There will also be a certain number of male birds, leaving about 700 pullets. These pullets will lay about 300 eggs per day, *i.e.*, 750 dozen eggs for the month. The feed bill may be taken as being 1s. per bird per month.

At the present time 11s. 9d. per day is the basic wage of the lowest grade railway porter, and may therefore quite fairly be considered the minimum wage for a poultry farmer, so that six days a week at 11s. 9d., and time and a half for Sunday—poultry farmers must work Sundays and Saturdays alike—represents £4 8s. 1½d. a week for the poultry farmers' wages, light help at 30s. a week, and interest on capital, depreciation, rates, &c., £100 a year. The balance-sheet for the 1,000 bird poultry farmer for June would therefore be as follows:—

	£	*s.*	*d.*
To interest on capital, depreciation, rates, &c., at £100 a year	8	6	8
To wages, self, £4 8s. 1½d. week	18	17	8
To wages, light help, at 30s. per week	6	8	7
To foodstuffs, 1,000 birds at 1s. each	50	0	0
To marketing and commission on 750 dozen eggs at 1¼d. per dozen	3	18	1
Balance	6	4	0
	£93	15	0
	£	*s.*	*d.*
By 750 dozen eggs at 2s. 6d. per dozen	93	15	0
	£93	15	0

The poultry farmer, therefore, during the month of June, obtained a net profit of £6 4s. on 750 dozen eggs at 2s. 6d. a dozen, which represents an actual profit of 2d. per dozen. No one can, therefore, accuse the poultry farmer of profiteering, and it becomes more obvious as time goes on how urgent it is that the public should be educated up to paying higher prices for poultry products, failing which many breeders will seriously curtail production.

Fortunately, after a somewhat alarming dry spell abundant rains have fallen, and the crop prospects are reported to be far more hopeful. It is most unwise to prophesy, and probably no one can say what the actual cost of foodstuffs used as fowl feed will be in 1921, although they will most likely be higher than at present. However, I feel confident that if the breeders will first and foremost co-operate, and secondly avoid all late hatching, the prospects for the 1921 season will be brighter than they have been for some years past.

The importation of eggs by Great Britain for 1919 was 56,443,950 dozen, as compared with 26,564,150 in 1918, and 215,799,500 in 1913—according to the latest figures from the Journal of the Ministry of Agriculture for March, 1920. The values of the foregoing quantities being declared, respectively, at £8,613,326, £4,621,649, and £9,590,602 The average values per dozen for imported eggs, therefore, were 3s. 0¾d. in 1919, 3s. 1¼d. in 1918, against 10⅔d. in 1913. It will be seen, therefore, that the importations for last year were only about 26 per cent. of the pre-war figures, although the price per dozen had largely increased.

One of the principal reasons for the fall in quantity, due to the cessation of supplies from Russia, which sent 114,532,770 dozen in 1913, or slightly over half the total number of eggs imported for that year by Great Britain.

Canada sent 14,769,620 dozen for 1919, as against 3,889,850 in 1918, and the United States 14,086,060, as against 3,373,450 in 1918.

The quantities from Denmark are as follows:—16,380,670 dozen for 1919, 11,705,350 in 1918, and 42,650,000 for 1913. The population of Denmark is only twice that of Victoria. When will the Victorian breeders see their way to forget petty differences, and co-operate to secure a share of this enormous market awaiting them overseas?

FARM NOTES FOR JUNE.

NOTES ON EXPERIMENTAL WORK, STATE RESEARCH FARM, WERRIBEE.

(*George S. Gordon, Field Officer.*)

Seasonal Conditions and Seeding Operations.

Seeding operations on the Experimental Fields were completed on 24th June, with the exception of a few plots reserved for late seeding tests. In addition to the usual plots, a few have been sown with electrified seed, and others are being used to test the value of a material from France called Physiological Fertilizer. The work extended over a long period, during which light showers (amounting to 222 points in May and 137 points in June) fell, but there were few interruptions on account of wet weather. On the whole, germination has been good, and the showers have helped the growth of the young crops. The germination has been excellent, and the crops have been assured a good start.

Top-dressing Lucerne for Winter Feed.

The top-dressing tests on the irrigated lucerne field at Werribee have shown striking increases on the yields of hay obtained from the manured plots. During the past month, the greater winter growth on some of the top-dressed plots has also stood out in marked contrast

with that on adjoining areas which did not receive fertilizers. The best of the plots are specified in order of merit hereunder:—

1. Plot which received 10 tons of farmyard manure and 20 cwt. of lime per acre.
2. Plot which received 10 tons of farmyard manure per acre.
3. All plots receiving 2 cwt. of superphosphate per acre; particularly when in conjunction with (*a*) gypsum, (*b*) lime, and (*c*) ground limestone, at the rate of 20 cwt. per acre.

The area which received superphosphate 2 cwt., and gypsum 20 cwt. per acre was apparently the best of those in section 3. On these the growth was quite double that on the untreated plots; and when one considers the value of the extra herbage for lambing ewes or other stock, at a season when "feed" is usually scarce, the importance of economically increasing the carrying capacity by supplying suitable fertilizers is at once apparent.

When sheep were admitted to the field, it was noticed that they ate out the growth on the top-dressed sections first. This probably indicates that it was more palatable or nutritious than that on the untreated plots, but no comparative feeding tests were carried out.

Most of the lucerne areas at the State Research Farm are "cut" in spring, summer, and autumn, and grazed at intervals during the five months—April to August—in which the crop is comparatively dormant. Careful records, taken during the past few years, show that in the grazing periods referred to, the field in which the plots mentioned are located carries stock equal to about five sheep to the acre. This field has an area of 50 acres, most of which is top-dressed with 2 cwt. of superphosphate per acre each year; but it also contains over 4 acres of untreated check plots.

Farmyard manure and the labour involved in spreading it are not always available on the average irrigation farm, but where the work can be carried out it would seem that this manure can be very profitably used on lucerne. Two cwt. of superphosphate can be economically distributed by the ordinary drill, after the winter renovation. This quantity has proved so profitable on the Research Farm that a section has been set apart to test the value of doubling the application; and it is interesting to note that, with 4 cwt. of superphosphate per acre, it gave the greatest yield of dry hay from any plot last year. The area was cut four times, and the total weight of hay harvested was 4 tons 7 cwt. per acre, as against 3 tons from a similar number of cuts on the unmanured plot.

Other fertilizers and lime in its various forms may be used with advantage as top-dressings for lucerne, but the experiments at Werribee to date go to show that to obtain a quick and profitable return for the smallest outlay of capital and labour, there is nothing equal to superphosphate.

Winter is the time to renovate and top-dress lucerne.

Do it now.

EXPERIMENTAL FARM, RUTHERGLEN.

(*P. B. O'Keefe, Manager.*)

The weather for the month has been all that could be desired, a total rainfall of 379 points having been registered. This was made up by gentle soaking falls at regular intervals, during which mild temperatures prevailed. In consequence of these favorable conditions grass has made fair growth, and crops have done remarkably well. Water supply in dams has been replenished. There has been some mortality among stock, but losses are slight compared with what might have occurred if typical June weather had been experienced. Ewes throughout the district are lambing, and in some cases where feed is scarce are reported to be deserting lambs and allowing them to perish. The later lambs will have a much better chance than those dropped early.

Many farmers are still busy planting crops, but the majority have finished. Crops planted since the 1st June have come through, and are making rapid growth.

Cultivation.—The planting of cereals has been completed. An area of 630 acres is overground on the farm apart from experimental area. Fallowing will be gone on with at an early date; all fallows will be sown with rape, and later with millet as a catch crop.

Dairy Herd.—Produce to the value of £1 17s. 6d. per cow has been disposed of for the month. In anticipation of a rise in the price of beef fat cattle have been held over, and will be sold in the near future at a price considerably in excess of previous estimate. Fodder consists of oat silage along with paddock and green crop pasture.

Sheep.—The cross-bred flock has commenced to lamb. At present ewes are being grazed on young oat crops, but this will be discontinued after 15th inst., except on those fields planted for grazing.

Pigs.—Twelve young cross-bred pigs, born on the 31st May, have done very well; they now turn the scale at an average weight per pig of 22½ lbs. The boars have been castrated, and all will be weaned at six weeks old, and divided into even lots of four for experimental feeding. They will be weighed weekly.

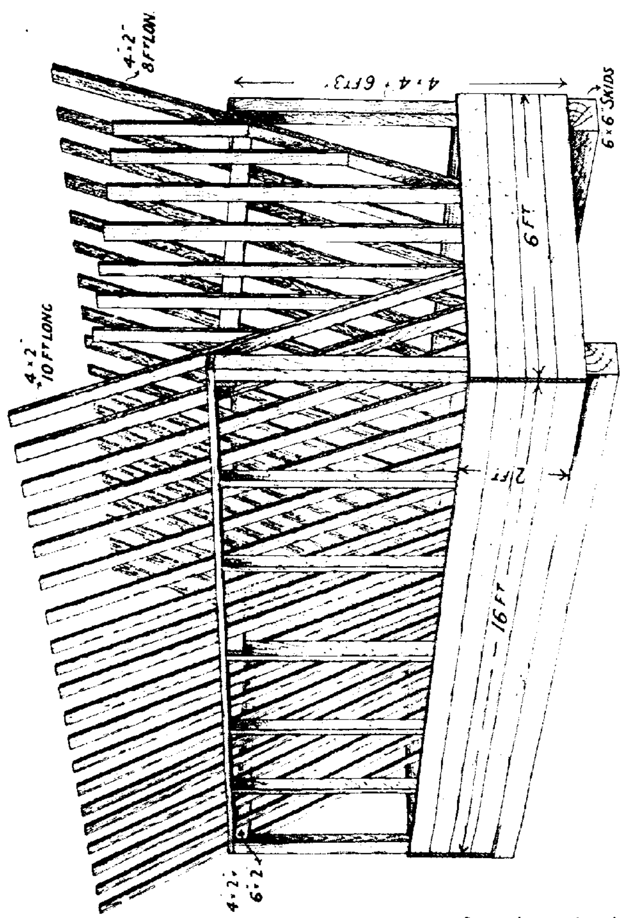
Two large York sows past breeding were sold at Wangaratta market as back fatters; the live weight of the two was 1,400 lbs.; the prices realized were £18 2s. 6d. and £18, which is a record.

Cross-bred pigs are still doing well; their live weight at six months old averages 185 lbs. each. It is intended to dispose of them on the 13th July, when their dressed weight should be from 130 to 140 lbs.; if, however, our weighings indicate that it will be profitable to keep them longer they will be held back for a further fortnight.

The pure-bred pigs being fattened have done much better latterly, but still have a lot of leeway to make up.

FEED RACK FOR CATTLE.

The plan of a feed rack illustrated hereunder is taken from a pamphlet issued by a United States Agricultural Experiment Station. The rack is mounted on skids made of 6-in. x 6-in. material. It is 16 feet long, 6 feet wide at the base, and the box 2 feet high. Besides the 2-in. x 6-in. cross-pieces at the ends, which tie the sides together, and to which the 2-in. x 4-in. uprights at the end are nailed, there is a cross-piece that ties the sides together at the centre.



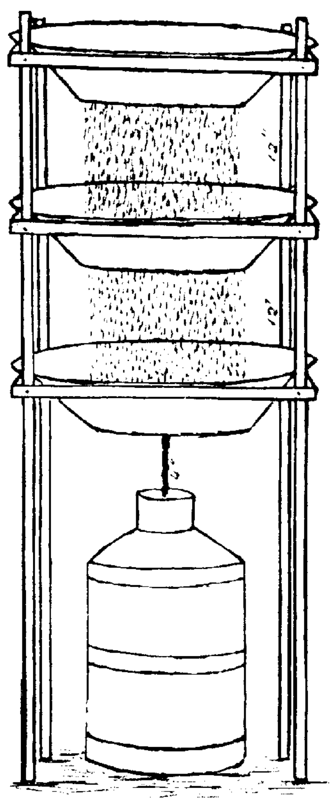
This type of rack has been used for years. Sometimes the feed arches after being eaten from below, would require to be pushed down.

In country where high saplings are available, the cost of construction may be considerably reduced by substituting these for some of the sawn timber.

MILK COOLING.

The accompanying illustration of a Milk Cooler, designed by Mr. Alex. Stewart, of Ballan, is reproduced from the Bacchus Marsh *Express.*

It is claimed that by the use of this cooler milk can be so cooled that it may be kept with safety in the can on the hottest nights, and that, in



addition, the cooling will expel the strong odours sometimes noticeable in milk from cows fed on rich pastures or rank growth of weeds.

The dishes in the coolers should be placed about 12 inches apart, the lower one about 4 inches above the milk can. The cross-bars, on which the dishes rest, should be about an inch and a half shorter than the width of the dish. The two lower dishes may be placed in position

from the top of the stand. The two upper dishes should have sufficient small holes punched in the bottom (by means of a nail) to allow the milk to escape at a rate corresponding to that at which it is milked. Mr. Stewart says he has found that with very large milk dishes one cooler will suffice for two milkers.

When in use, the coolers should be placed in a shady spot where there is a free circulation of air.

The following comment on the above is made by Mr. J. S. McFadzean, Senior Dairy Supervisor:—

When cooling it is also most advisable that the milk be kept protected from both flies and dust. The good done by cooling will be largely discounted if the milk should become contaminated during the process by flies or dirt, for its keeping qualities will thereby be altogether destroyed. Dirt is the greatest trouble that distributors and others handling milk have to contend against. Dirt hastens the formation of acid in milk, and the souring of the whole immediately follows. With cleanly methods of handling, the cooling of milk as soon as it is drawn from the cow is the very best thing that can be done to allow of its being distributed to the consumer in a wholesome condition. The more slowly milk is run in cooling the more effective the aeration will be, particularly if the surrounding air be cool and all contamination guarded against.

AGRICULTURAL CO-OPERATION IN ENGLAND.

Some account of the striking development of agricultural co-operation in England during the last year will be of interest to the wider circle of agriculturists. Much was heard of the word "reconstruction" during the last stages of the war and for the first few months following it, but it is difficult to point to any achievement in this direction in most departments of national life. It is pleasant to be able to say that agricultural co-operation is an exception. The progress made during the past twelve months has been little short of phenomenal compared with the previous rate of growth.

Prior to the armistice, besides a certain number of co-operative dairy societies, some co-operative slaughter-houses, and a large number of small societies dealing with eggs, poultry, fruit, market gardening, and allotments, there were only six or seven large co-operative farmers' societies for the purchase of raw materials (feeding stuffs, fertilizers, seeds, machinery, &c.), which covered but a fraction of the country. In other districts there were either under-capitalized and struggling societies or no societies at all.

The prospects of English farming after the war have been by no means clear. There has been an unstable market in farmers' requirements and a feeling of uncertainty as to what will happen when control

is removed in the various branches of the industry. The introduction of the minimum wage and of standardized working hours into agriculture has introduced a factor the future effect of which it is impossible to calculate. The prospect of severe competition from imported food is always present in the farmer's mind. In spite of governmental assurances, the farmer is for all these reasons justly apprehensive as to the future of his industry, in some cases even to the extent of fearing a return to the hard times experienced between 1880 and 1900.

The result has been to make him incline his ear favorably to the claims of co-operative trading, which leads to a real economy in production and a more advantageous system of marketing his produce. The fact that most other businesses have during the war made themselves strong by amalgamation and combines has helped in this process, for nowhere are there more combines, rings, and cartels than in the agricultural trade.

The position was admirably put in a letter to a leading farming paper recently: "What is and has been," asks the writer, "the position of the isolated independent farmer working his business as a private trader? He buys a machine here, an implement there, a few tons of cake or artificial manure somewhere else, a few quarters of seed and feed corn, or a few bushels of small seeds, and so on, in another place. These have all to be sent separately, and naturally expensively. To express the matter in a sentence, he is buying retail and at a retail figure. But when he goes to sell his produce, the boot is on the other foot; he has to sell to the miller, to the merchant, or to the butcher wholesale, so that the individual farmer, working, selling, and buying as a private trader, is buying in a retail market and selling in a wholesale one. But as one of a body of farmers under co-operation he has means in his hands of buying, as well as selling, wholesale."

During the year, the Agricultural Organization Society, the non-trading and non-political central organization of the agricultural co-operative societies in England and Wales, has held nearly 300 meetings all over the country to make the farmers' co-operative movement national in its scope. Its principal aim has been to establish in every country one or more large and well-capitalized societies for the purchase of the farmer's requirements and the sale of his produce, and in the case of counties where societies already exist, to get them strengthened by increase of capital and unified by amalgamations.

This campaign met with instantaneous success. During the past eighteen months, societies have been formed in the following counties:—Northumberland, Durham, Cumberland, Yorkshire, Lincolnshire, Nottinghamshire, Warwickshire, Herefordshire, Devonshire, Cornwall, Somerset, Dorsetshire, Buckinghamshire, Surrey, and Kent. Some of these societies aim at covering the whole of their respective counties. In other cases, the counties were already partially covered, or in the case of the larger counties more than one society has been found necessary. Besides these new societies, in certain counties, such as Staffordshire, Derbyshire, and Leicestershire, amalgamations have taken place, and elsewhere the older societies have vastly increased their membership and capital.

The leading farmers through England now take great interest in the movement, and the most prominent feature of the campaign has been the readiness of farmers to subscribe sufficient capital, in most cases £20,000 to £50,000, to start their own society on a thoroughly sound basis, and be able to afford the best brains in the agricultural trading world for their management.

In January, 1920, the societies affiliated to the Agricultural Orzanization Society included 469 trading societies dealing in farm requirements and produce, and 920 small-holders and allotments societies. Over one-third of the farmers in England and Wales hold shares in these societies, of which the annual turnover exceeds £10,000,000 sterling.

All societies are, of course, formed under the Industrial and Provident Societies Acts. Share capital is limited to £200 per member: interest is limited to 5 per cent. or 6 per cent. A co-operative society exists to make savings rather than profits, but any profits that arise after payment of interest, &c., and adequate provision for the reserve fund are divided on the well-known co-operative principle, *i.e.*, in proportion to the business which each member has done with his society.

A further enlightening fact is that the Agricultural Wholesale Society, formed two years ago to act as the co-operative wholesale society and the control trading body for agriculturists, has had a growth commensurate with the growth in the counties. It is equipped, not only to buy farm requirements in bulk, whether at home or overseas, for distribution to the individual societies, but also to dispose of their united produce in the great markets of the world. The whole of its shares are owned by the agricultural co-operative societies in the country, and its profits go back to the member societies in proportion to the volume of their trade with it.

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ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

PRUNING.

Pruning operations will now be in full swing. In pruning the young trees, heavy pruning will be required in order to produce strong growths and a good frame, but as the tree advances in age the pruning will be reduced considerably. It should be remembered that strong, heavy pruning results in wood growth, and that weak pruning steadies the tree, and promotes an even growth. When framing and building a tree, the former consideration is observed, and when the tree is coming into fruit bearing or is mature, it will be pruned according to the latter. Any operation that will cause the tree to produce less wood growth will induce the tree to become more fruitful, provided the tree be in a healthy condition; so that when trees are mature, pruning operations, as a rule, should not be severe, but rather the reverse.

Old fruiting wood, and dead and dying wood should always be removed, and aged spurs should be considerably reduced, in order to make them produce new growths. Crowded and overlapping laterals should be shortened back; fruit-bearing in the higher portions of the tree should not be encouraged; and due consideration should be given to the admission of light and air to all parts of the tree.

Where varieties of fruit trees are prone to bearing crops every second year, their lateral system should be pruned so that they will not produce too heavy a crop in the fruiting year; and at the same time they will produce wood in their fruiting year to give a crop in the subsequent season.

A model tree will always be light on its topmost leaders, bearing the major portions of the crop in the lower regions of the tree. The main point to be noted is that a heavy wood growth in the upper portion of the tree tends to reduce the bearing capabilities of the tree in its most useful parts.

DRAINAGE.

The rains of winter will always show the necessity for draining orchards. Where under-soil drains do not exist, the trees are bound to suffer. If the damage is not immediately apparent, it will be later found that in some way loss will accrue. Either the tree will be weakened by the loss of roots through rotting, or it will be devitalized so that it will not carry a satisfactory crop of fruit. Too often surface drainage is relied on to remove the so-called surplus water. There should be no surplus water for surface drains. The water is only surplus or excess when it is in the soil. Two circumstances, and two only, permit of surface drainage. First, when it is necessary to carry

away excessive stormwater; and, second, when it is practically impossible to find an outlet for under-drains, owing to the low-lying situation of the area.

The term "surface drainage" does not apply to open drains, which, owing to their depth, act also as soil drains; neither does it apply to graded surfaces which allow a more equitable distribution of water. Surface draining is usually applied to a system, whereby a considerable quantity of water is removed by gravitation before it enters the soil. Such a system cannot be too roundly condemned. As much water as can be obtained by natural means should be induced to enter orchard soils; and then whatever is in excess will be carried away by under drainage, provided that drainage, either natural or artificial, be in existence.

Where suitable drainage is not provided, the tree roots are compelled to remain in a few inches of surface soil. Their feeding area is thus extremely limited indeed; and when, at any time, rain-water does filter and penetrate through the soil, it carries with it the soluble and other plant foods, below the reach of the tree roots.

Soil ventilation is only possible with a system of drainage, and air is as necessary to the roots of a tree as it is to the foliage. By the removal of the surplus water and the consequent admission of air into the soil, the soil temperature is rendered far more equable, warmer in winter and spring, and cooler in summer; and such a change must be beneficial to the trees.

Drainage is thus an essential for all orchard lands. When natural drainage occurs, the orchardist is fortunate; but whether natural or artificial, a system of drainage will always materially increase the crop of fruit, strengthen the trees, and considerably add to their term of life.

Drainage schemes should be carried out at the present season of the year. In closed drains, such drainage media as cinders, charcoal, stones, brushwood, timber, logs, or tile pipes may be used, but the latter generally give more satisfactory and permanent results. They are also less liable to silting up than any other material.

Drains should be placed into the clay, if this be not too deep. In any case, they should be below any possible interference from cultivating instruments.

SPRAYING.

In order to keep in check such pests as Bryobia, scale insects, woolly aphis, and others, a strong and forcible spraying with lime sulphur or red oil spray should not be delayed any longer. The whole tree should be thoroughly wetted with the spray. A good, vigorous, and thorough winter spraying will place a large majority of the trees in quite a satisfactory condition of freedom from these pests for the whole year.

The lime sulphur spray is an excellent fungicide, and a strong winter spray will go a very long way in reducing any attack of the black spot fungus on either the apple or the pear. In addition, if the

peach trees are sprayed at this time with lime sulphur, both peach aphis and peach leaf curl will be considerably minimised in the spring time.

The Flower Garden.

Digging in the garden should be continued. Before digging, the beds should be given a top dressing of lime or stable manure, and subsequently these should be dug well into the soil. Care must be taken not to injure the roots of any shrubs, trees, or roses. Root cutting and root pruning will always dwarf any plant. In digging, it is not wise to discard any leaves, twiggy growths, or weeds. Unless they are required for the compost heap they should always be dug into the soil. Leaf-mould is especially useful in any garden, and where such plants as Azaleas, Rhododendrons, Liliums, &c., are grown, or for pot-plant work, it is exceedingly valuable. In forming the compost heap, no medium whatever should be added to help the rotting down of the leaves unless it be a little sand. Any chemical added will render the mould unsuitable for its special objects. The plants mentioned above strongly object to lime.

All shrubs that produce flowers on their young growths, including roses, should now be pruned. Care should be taken to distinguish between those shrubs that flower on the new wood and those that flower on the wood of the past season's growth. Those that flower on the new wood, and may now be pruned, are Lantana, Cestrum, Tecoma, Hydrangea, Plumbago, Erythrina (some species), &c., and those that should not be touched at present time are Spirea, Erythrina (some species), Pyrus Japonica, Weigelia, Prunus pissardi, P. Vesuvius, P. mume, Deutzia, Polygala, Ceanothus, &c. It is a safe rule in pruning shrubs to wait until they have flowered before pruning. This will certainly give the shrubs a somewhat ragged appearance in the winter, but it is the only way to secure the best flowering results.

All herbaceous plants, such as Salvia, Aster, Delphinium, Polygonum, Boltonia, Gaura, and Chrysanthemum, should be cut back, and, if necessary, lifted and "heeled in" in a temporary location for the winter. Plant out early Gladioli, Iris, and Liliums.

Continue digging, manuring, and trenching.

The Vegetable Garden.

Seedlings from boxes or seed plots may now be planted out. Care should be taken that all vegetable beds are well raised and thrown up. By throwing up the soil, and thus deepening the paths and the spaces between the plots, the latter are well drained, and the soil is made considerably warmer. This will greatly facilitate the growth of the young plants.

Asparagus may be planted; sow seeds of carrots, parsnips, cauliflowers, onions, peas, broad beans, and tomatoes, the latter being forced on in a frame, so as to obtain good plants quickly.

REMINDERS FOR AUGUST.

LIVE STOCK.

HORSES.—The feeding and general management of horses recommended for July will also apply for this month. Horses, more especially young ones, running on low-lying country are liable to become affected with internal parasites. This will be recognised by the unthrifty and poor condition of the animals; in such cases medicinal treatment will be necessary. If the following lick be made available, it will not only be of great assistance in preventing serious invasion, but in cases where worms are not in large numbers, the repulsion of them from the intestinal tract will result:—

Lick.

20 parts salt.

10 do. lime.

1 do. sulphate of iron.

If possible, be with mares at foaling, so that the navel cord may be properly tied and thoroughly treated with antiseptic, and thus prevent that very fatal disease, navel or joint ill. Wash cord with one part of corrosive sublimate to 3,000 of water, and soon after paint with tincture of iodine. The iodine treatment must continue till the cord has completely dried up.

CATTLE.—Cows should still be rugged, but coverings should be removed frequently, in order to enable the animal to get rid of the old coat; or, better still, a good curry-combing may be given. Continue hay or straw. Look up treatment for milk fever in *Year-Book of Agriculture*, 1905, and treat cattle accordingly. Give calves a good warm dry shed. Give the milk to young calves at blood heat. Have feeding troughs or buckets clean. Don't over-feed. Feed regularly with regard to quantity and time. Provide a good grass run, or fine hay or crushed oats in a box or trough. Give a cupful of limewater per calf per day in the milk. The problem with many at the present time is how to rear calves without milk. This can be done very well by starting them on new milk for a fortnight, and then gradually substituting the milk with one of the calf meals on the market. To these it would be advisable to add two or three tablespoonfuls of cod liver oil. The following meal is in general use in Ireland:—Two parts, by weight, of oatmeal, 2 parts maize meal, 1 part pure ground linseed, all finely ground. Scald with boiling water, and allow to stand for twelve hours. Start with new milk, then gradually substitute skim and ¼ lb. daily of the meal mixture per head per day, gradually increasing to 1 lb. or more. In a month milk may be dispensed with altogether. The crushed oats, fed dry, have been found to give excellent results.

PIGS.—Supply plenty of bedding in warm well-ventilated sties. Keep sties clean and dry, and feeding troughs clean and wholesome. Sows may now be turned into grass run. If pigs are lousy dress with kerosene emulsion or sulphur and lard, rubbing well into crevices of skin, and disinfect sties. Crushed wheat from Wheat Board is the cheapest food available now. Worms are very prevalent at present, and may be treated by giving 2 to 10 grains of Santonin in form of pill, or from half to one teaspoonful of oil of turpentine in milk or castor oil.

SHEEP.—Decide on the breed and number of ewes and rams required for the coming season. Place orders as soon as possible. Breeders can then give better satisfaction, and allot preference to the earlier applications. The result of mating should be given most careful consideration from a wool point of view. Evidence points to an extreme shortage of good merino and fine cross-bred wool for years to come. At the same time, a steadily increasing demand has set in for materials manufactured from these finer grades. The world's civilian requirements must be met, and for flannels and finer materials for temperate and cold climates these are indispensable. After all coarse wools have a limited use. Cull stud ewes

carefully, especially merinoes, consider form as well as evenness of covering and style of wool. Discard for thin fribby forearms, for coarse common thighs, for mushy wasty undercovering, inferior patches across the shoulders, common and short between the hip bones, narrow frames, and weak necks. Individual merit must be considered first, pedigree alone is not sufficient.

Poultry.—Yards should be turned over with a spade or fork, and sown down with rape or barley. Keep the breeders busy—straw litter with a little grain scattered about will make them exercise. Overhaul incubators; see that the capsule of thermostat acts properly; thoroughly clean lamps, egg drawers, and chimneys. Test machine for two days before putting eggs in. It is also advisable to have thermometer tested. When additional incubators are required, it is more satisfactory, to keep to the one make.

CULTIVATION.

Farm.—Second fallow where necessary for summer crops. If required, roll or harrow crops. Plant very early potatoes in forward districts. Sow mangolds. Apply slow-acting fertilizers, such as blood and bone manures, for maize.

Orchard.—Complete planting and pruning of deciduous trees. Watch for peach aphis, and spray with tobacco solution, if present. Prepare for planting citrus trees. Spray for woolly aphis with lime sulphur or red oil spray.

Flower Garden.—Finish digging and pruning of roses, &c. Leave pruning of shrubs till after flowering. Keep weeds in check; weed out seed beds. Divide and plant out all herbaceous plants, such as phlox, delphiniums, rudbeckia, &c. Plant out gladioli. Complete planting of shrubs. Mulch young plants.

Vegetable Garden.—Top-dress asparagus beds; plant new asparagus plots. Plant herb divisions, and potatoes. Sow cabbage, cauliflower, peas, carrots, beans, radish, and lettuce seeds. Sow tomato seeds in a hot frame. Finish digging.

Vineyard.—August is the best month for planting vines (grafted or ungrafted). This should be actively proceeded with and completed before end of month. Scions for field grafting may still be preserved as detailed last month, or better still by placing them in cool storage. They should all be removed from vines before end of month, at latest. Conclude pruning and tie down rods. Where black spot has been prevalent, apply first acid iron sulphate treatment. Owing to the dry spring, black spot was not in evidence last season. The fungus is not dead, but dormant, hence preventive treatment must not be neglected. Leaflets dealing with black spot and its treatment will be supplied on application.

Cellar.—Rack again, towards end of month, wines which have as yet only been once racked (spring racking). Fill up regularly all unfortified wines. Clean up generally in cellar and whitewash walls, woodwork, &c.